Remedial Action Selection Summary Report Former ExxonMobil Oil Terminal Lighthouse Point Ogdensburg, New York

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Ogdensburg, NY

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1.0 Introduction

This Remedial Action Selection Report (RAS) has been developed per exhibit D of Order on Consent A2-0471-1202 (order on consent) and per the approval of the RAS Work Plan prepared by Groundwater & Environmental Services, Inc. (GES) on behalf of ExxonMobil Oil Corporation (ExxonMobil) dated 9 September 2005. The approval was provided by the New York State Department of Environmental Conservation (DEC) in correspondence dated February 7, 2006.

This RAS includes the evaluation of alternative remedial methods in accordance with the appropriate Sections of Draft DER-10, dated December 2002 (DER-10) and Section II of Order on Consent.

2.0 Purpose

This RAS is prepared in order to identify and evaluate the most appropriate remedy for remediation of soil and groundwater impacts from historic operation of the former ExxonMobil Oil Terminal located in Ogdensburg, NY.

3.0 Site Description and History

ExxonMobil and its predecessors owned and operated a petroleum products storage and distribution terminal on approximately 5 acres of land in the City of Ogdensburg, New York adjacent to Lighthouse Point ("Site"), Figures 1 and 2. The land was acquired from within a significant active railroad operation which is described in more detail below. Operation of ExxonMobil's petroleum products storage facility began in 1898 and ended in 1984. The former ExxonMobil operations included a facility on the eastern side of the peninsula that was historically used to off load barges delivering fuel to the terminal and for a portion of the pipeline easement servicing the terminal. These lands included wagon storage sheds and warehouses. In addition, this property contained a total of 4 petroleum storage tanks (2 of which were reportedly underground) directly adjacent to a rail siding and roundhouse. Anecdotal information provided that ExxonMobil also operated an empty drum storage area on land adjoining the ExxonMobil barge dock property.

On the western side of the peninsula ExxonMobil owned and operated a terminal consisting of 7 above ground storage tanks, a pump pad / pipeline manifold, and a 2 bay truck load rack. The barge dock and tank farm properties were connected by a pipeline corridor that was used to convey fuel as it was offloaded from the barges to the above ground storage tanks at the terminal. Products handled during the historic operation were limited to gasoline, diesel, fuel oil, and kerosene. The ExxonMobil petroleum handling infrastructure was removed from service in the early 1980s and disassembled in the mid

1980s. The pipeline corridor area and adjacent land operated as a railroad yard from the mid-1800s to the 1970s. The pipelines were excavated and removed from the pipeline corridor during August 2002 (see the "Site Assessment Report, Former ExxonMobil Ogdensburg Terminal, Lighthouse Point, Ogdensburg, New York", dated 19 September 2002).

The Lighthouse Point Area saw heavy railroad use, including passenger and freight service, depots, 3 roundhouses and turntables, and a railcar ferry service to Canada. The railroad and associated businesses grew on Lighthouse Point in association with the rail activity in the area and included a stockyard, coal storage, grain storage, and icehouses. It is unknown exactly when the use of the property for rail operations began, however; Sanborn Maps from 1884 show the presence of significant rail infrastructure, indicating that rail development was underway for many years prior to 1884 by both the Black River and Utica Rail Road and the New York Central Rail Road. The Black River and Utica Railroad Company was incorporated in 1853. Rail service in Upstate NY began along the Albany to Buffalo corridor in approximately the 1830s. It is likely that rail operations were first present on Lighthouse Point in the 1850s based on the incorporation date of the Black River and Utica Railroad Company and the commercial / industrial significance of the development of a rail ferry to Canada. *The Quarterly*, Volume XXXV, No.1, January 1990, states that the Rome, Watertown, and Ogdensburg Railroad was placed in service on Lighthouse Point on 4 August 1862.

The historic record indicates that, rail operations ceased on Lighthouse Point in the 1970s. This history provides a period of industrial rail activity likely spanning between 120 and 130 years. The use of the property as a rail yard preceded any ExxonMobil operation (which first appears on a Sanborn Map from 1898) by an estimated 35 years. The rail yard operations occupied approximately 40 acres on Lighthouse Point. The ExxonMobil pipeline corridor easement and barge dock facility combined, measured approximately 1.1 acres within the historic rail yard operations (approximately 0.5 acres for the pipeline easement and 0.6 acres for the barge dock facility).

There are published reports of the operation of a city dump on the peninsula (see *The Quarterly*, Volume XXXV, No.1, January 1990). Field evidence of a dump operation has been noted, especially on the west side of the peninsula, immediately northwest of the former tank farm, and north of the former pipeline corridor, where broken glass, bottles, scrap metal, boots, and old clothes are prolific at the ground surface in a reforested area. Beaches on the western side of the peninsula consist entirely of weathered broken glass in some locations. Soil borings conducted in this area during the investigative phase of work recovered ceramics, glass, bricks, and other rubble. During test pit activities conducted as part of the October/November 2004 supplemental investigative phase, further evidence for the municipal dump operations was noted along and to the north of the pipeline corridor, including buried drums, ash, scrap metal, glass, bricks, coal, coal slag, cinders, railroad ties, and other debris. These conditions were also confirmed during the implementation of the IRM during October through December 2005. During the excavation of the eastern portion of Area 1 the above noted fill materials along with

other solid waste items such as shoes and house hold fixtures were observed. The approximate location of the historic St. Lawrence River shoreline is shown in Figure 2, for the years 1853 and 1925. Based on the mapped shoreline locations and field evidence, it appears the west side of the peninsula consists of urban fill.

4.0 Summary of Remedial Investigations and Interim Remedial Measures

The following is a summary of previously submitted reports as listed below that have been submitted to the NYSDEC. The data set is summarized in this section to facilitate ease of review of this RAS.

- Site Assessment Report, Former ExxonMobil Ogdensburg Terminal, Lighthouse Point, Ogdensburg, NY, dated 19 September 2002

- Remedial Investigation Report , Former ExxonMobil Terminal, Ogdensburg, NY Dated 21 February 2005

- Interim Remedial Measures Site Activity Summary Report, Former ExxonMobil Oil Terminal, Lighthouse Point, Ogdensburg, NY, dated 2 February 2006

Additionally, quarterly progress reports have been issued with the following dates:

- 19 January 2005
- 6 April 2005
- 8 July 2005
- 6 October 2005
- 6 January 2006
- 5 April 2006

Investigation work at the former barge dock facility began in 1988 in response to the reported discovery of petroleum impacted soils and groundwater during an archaeological investigation for a former French settlement identified as Fort LaPresentation in 1987. Environmental investigation and monitoring work was performed on this parcel between 1988 and 1997.

A soil and groundwater investigation was conducted on the current Fort LaPresentation property in 2001 (see "Phase II Subsurface Investigation, Fort LaPresentation, Ogdensburg, New York", prepared by Atlantic Testing Laboratories (ATL), dated 31 December 2001 on behalf of the Fort LaPresentation Company). Petroleum hydrocarbon impacts were identified on this property in areas near the former terminal infrastructure and pipeline corridor, as well as other areas of the site. The borings and temporary wells completed as part of this study are shown on Figure 3. As a result of the findings of the ATL study, the NYSDEC requested that ExxonMobil complete a subsurface investigation on the former tank farm property.

GES completed a work plan for this investigation, which was submitted to the NYSDEC in April of 2002. The work plan included a sensitive receptor survey and shoreline inspection, proposed soil and groundwater sampling for NYSDEC STARS listed compounds on the former tank farm parcel, as well as work in and around the pipeline corridor between the former tank farm and the barge dock. The work plan was approved by the NYSDEC in a letter dated 12 April 2002. In order to complete this work, ExxonMobil obtained property access from the City of Ogdensburg and Fort LaPresentation for the purpose of collecting soil and groundwater samples. Data collection occurred between the months of May and August 2002. A total of 74 soil borings were completed, along with the installation of 29 temporary monitoring wells (Figure 3). The investigation work documented petroleum hydrocarbon impacts to soil and groundwater on the former tank farm, load rack, and pipeline corridor areas (see Tables 1 thorough 8 for soil and 9 through 12 for groundwater data. The results of the investigation are summarized in the GES document "Site Assessment Report, Former ExxonMobil Ogdensburg Terminal, Lighthouse Point, Ogdensburg, New York", dated 19 September 2002. See Figure 3 for a presentation of all soil data collected at the site during the assessment phase.

Based on the findings of this study, ExxonMobil determined that remediation of petroleum hydrocarbon impacts to groundwater and soil delineated by the investigation would be necessary. In 2003, GES, prepared a Remedial Action Plan (RAP) for the site (see the Remedial Action Plan, Former ExxonMobil Oil Ogdensburg Terminal, Lighthouse Point, Ogdensburg, New York", dated 11 August 2003). This work was conducted in accordance with the NYSDEC document "Draft DER-10, Technical Guidance for Site Investigation and Remediation", which was released for comment on 25 December 2002 (DER-10). However, additional investigation activities, were first required by the NYSDEC and were conducted in October and November 2004. These investigation activities were performed in accordance with a NYSDEC approved work plan prepared by GES (see "Supplemental Remedial Investigation Work Plan, Former ExxonMobil Ogdensburg Terminal, Lighthouse Point, Ogdensburg, NY", dated 15 September 2004).

The following lists test pits conducted as part of the additional investigation activities referenced above. The total number of test pits actually completed was increased over the proposed based upon field conditions encountered. The final distribution of completed test pits in October 2004 is as follows:

- 17 test pits were completed near the pipeline / rail crossing area. Test pits TP-3449 through 3463 as planned and 3600 and 3601 were added.
- Five test pits were completed at and around pipeline post removal sample PT+268, test pits TP-3444 through 3448.
- Eight test pits were completed near the location of the historic 1977 release. Test pits TP-3436 through 3443. Four of these test pits (TP-3436 through 3439) served the dual delineation purpose for both the 1977 release area and the pump pad/pipeline manifold area.

- 13 test pits were completed in the area downgradient of the former load rack area. Test pits TP-3429 through 3435 as planned and TP-3602 through 3607 were added.

GES observed the completion of the above listed 43 test pits along with representatives from the NYSDEC. Test pits completed on lands owned by the Fort were also observed by an employee of ATL, representing the Fort. In addition to the completion of the listed test pits, ten permanent 2 inch diameter groundwater monitoring wells were installed at the site (MW-41 through MW-50, Figure 3).

NYSDEC representatives collected soil samples from select test pits. NYSDEC collected samples were analyzed by Severn Trent Laboratories for total petroleum hydrocarbons via NYSDOH Method 310-13 and for volatile and semi-volatile organic compounds via EPA Methods 8260 and 8270 plus TICs via the NYS laboratory in Albany, NY. GES retained a minimum of one soil sample per test pit or monitoring well for total petroleum hydrocarbons via NYSDOH Method 310-13 and for volatile and semi-volatile organic compounds via EPA Methods 8260 and 8270 plus TICs, in accordance with the approved work plan.

The findings and results of the supplemental investigation were provided to NYSDEC in February 2005 (see "Remedial Investigation Report, Former ExxonMobil Oil Terminal Ogdensburg, NY", dated 21 February 2005). However, on 25 March 2005 ExxonMobil was informed that the above document dated 21 February 2005 was not approvable as written. After a series of meetings between NYSDEC, ExxonMobil, and GES, a format for an addendum was agreed upon (see "Remedial Investigation Report Addendum, Former ExxonMobil Oil Terminal, Ogdensburg, NY", dated 15 July 2005). The subject Addendum along with the RI Report dated 21 February 2005 was approved by the NYSDEC in a letter dated 23 August 2005.

An Interim Remedial Measure (IRM) Work Plan dated 9 September 2005 and clarifications included in letters dated 27 September and 17 October 2005 were prepared by GES. The IRM with noted clarifications was approved by the NYSDEC in correspondence dated 19 October 2005. The IRM work plan included three areas of soil excavation followed by an application of nutrients and oxygen releasing compounds in order to enhance the biological degradation of residual petroleum. The approved IRM work plan also included groundwater monitoring to evaluate the effectiveness of the IRM. The IRM was executed between 24 October 2005 and 22 December 2005. These field activities were documented in a post IRM Report prepared by GES (see "Interim Remedial Measure Site Activity Summary Report", dated 2 February 2006). Areas of proposed and actual excavation, as well as the location of all sampled groundwater monitoring wells are shown on Figure 3.

The nature of potential contamination associated with the former ExxonMobil operation at the Site is petroleum impacts related to the historic operation of the former ExxonMobil tank farm, 2-bay load rack, pipeline corridor, and barge dock facility along with associated pipe manifolds and pump pads. The types of compounds associated with

the nature of petroleum related impacts at the subject site are volatile organic compounds and semi-volatile organic PAH compounds found in the specific grades of petroleum products stored at the terminal (gasoline, diesel, fuel oil, and kerosene).

5.0 Remedial Goals and Remedial Action Objectives (RAOs)

In accordance with DER-10, Section 4.1 (b) and Exhibit D of Order on Consent, the remedial goal is established as the "restoration of a site to pre-disposal/pre-release (pre-discharge) conditions, to the extent feasible and authorized by law". And, per DER-10 and Section II. F. 2. of the Order on Consent, "At a minimum, the remedy will eliminate or mitigate all significant threats to public health, presented by the contaminants disposed at the site through the proper application of scientific and engineering principles".

Further, "where an identifiable source of contamination exists at the site, it will be removed to the extent feasible."

Also, in accordance with DER-10 Section 4.1(c) and Appendix 4a, RAOs are medium specific objectives for the protection of public heath and the environment and are developed based on contaminant specific standards, criteria, or guidance values (SCGs). Apendix 4a of DER-10 provides RAOs for various media. In order to establish RAOs for this site, DER-10 requires that the following must be completed:

1. Identify all contaminants exceeding applicable SCGs and the associated environmental media impacted.

2. Identify applicable SCGs taking into consideration the current, and where applicable, future land use of the site.

3. Identify all actual or potential public health and or environmental exposure resulting from contaminants in the environmental media at or impacted by the site.

4. Identify any site specific clean up levels developed pursuant to section 3.10.2 (e).

5.1 Remedial Goals

The project specific remedial goal is to restore the site to pre ExxonMobil release conditions, to the extent feasible and at a minimum eliminate or mitigate all significant threats to public health from contaminants discharged at the site by ExxonMobil's historic operations. ExxonMobil remains committed to this goal by remediating primary and secondary sources of petroleum impacts from ExxonMobil's historic operations. However, based upon the nature of Lighthouse Point's long term industrial activity, with similar use and discharges of petroleum hydrocarbons, it is likely not feasible and

technically impractical to differentiate pre-disposal / pre-release conditions for certain contaminants. Furthermore, due to the nature of the contamination (volatile and semi-volatile petroleum hydrocarbons), site geology and hydrogeologic conditions it is also likely not feasible and technically impractical to restore the site to pre-disposal / pre-release conditions in an expedited time frame through available remedial technologies or measures.

With regard to "identifiable sources" of contamination from ExxonMobil's historic operation, primary sources were removed from the site during the mid 1980s with discontinuation of operations and removal of all above ground infrastructure and removal of all subsurface infrastructure following completion of the 2002 and 2005 Interim Remedial Measures. Secondary sources of contamination are limited to isolated locations of unsaturated soils following completion of the 2005 IRM (see Figure 4). No measurable subsurface free product has been identified during the multiple investigation phases, groundwater sampling and gauging events, and excavation conducted as part of the 2002 and 2005 IRMs.

It is however possible to eliminate and mitigate significant threats to public health, if any, presented by the contaminants from ExxonMobil's historic operations at the site through the proper application of scientific and engineering principles in order to allow for the continued current use of all properties and the planned future use as currently provided to ExxonMobil.

5.2 Remedial Action Objectives (RAO)

1. *Identify all contaminants exceeding applicable SCGs and the associated environmental media impacted.*

The contaminants exceeding applicable SCGs in associated site media has been documented in the above referenced site assessment reports and updated by the above referenced 2 February 2006 Interim Remedial Measures Summary Report. Collectively, these reports provide the identification of all contamination exceeding SCGs in associated media.

2. *Identify applicable SCGs taking into consideration the current, and where applicable, future land use of the site.*

The current and future land use has been provided by the property owners. Based upon these representations the appropriate SCGs are established by NYSDEC guidance documents TAGM 4046 and TOGS 1.1.1 for soil and groundwater respectively. However, it is noted that TOGS 1.1.1 is a conservative SCG since groundwater is currently not used and has not been identified for future use at this site. The only potential for exposure to groundwater is incidental contact during ground disturbance activities.

Presently based upon current conditions, there are no appropriate SCGs established by guidance for air. However, it is acknowledged that a reevaluation of relative SCGs for specific future use issues regarding indoor air may be required.

3. *Identify all actual or potential public health and or environmental exposure resulting from contaminants in the environmental media at or impacted by the site.*

All actual or potential public health threats and or environmental exposure resulting from contaminants of ExxonMobil's historic operations have been provided in the previously submitted Qualitative Exposure Assessment, dated 28 May 2004. However, based upon additional investigation and IRM activity this document has been updated and the appropriate sections provided as Attachment 1.

4. *Identify any site specific clean up levels developed pursuant to section 3.10.2 (e).*

There are no site specific cleanup levels identified pursuant to Section 3.10.2(e) of DER-10 as provided by the previously submitted fish and wildlife resource impact assessment in the 28 May 2004 document. However, based upon additional investigation and IRM activity this document has also been updated and the appropriate sections provided as Attachment 2.

Medium Specific Remedial Action Objectives

Appropriate medium specific RAOs include those for soil and groundwater. Soils were initially impacted by ExxonMobil from infrastructure associated with the operation of the of the historic ExxonMobil terminal. Groundwater was impacted from the leaching of contaminants from impacted unsaturated soils or where subsurface ExxonMobil infrastructure was in direct contact with groundwater. Surface water and sediments have not been impacted by ExxonMobil's historic operation based upon site assessment results. Appendix 4a of DER-10 provides guidance for RAOs which adopted below are appropriate for the site conditions:

Groundwater

- Prevent ingestion of groundwater with contaminant levels, attributable to ExxonMobil, exceeding groundwater SCGs.

- Prevent contact with or inhalation of volatiles from groundwater contaminated as a result of ExxonMobil's historic operations.

- Restore groundwater conditions where impacted by historic ExxonMobil operations to pre-ExxonMobil disposal / pre-ExxonMobil release conditions to the extent practicable.

- Remove the ExxonMobil attributable sources of groundwater contamination.

See Attachment 1 which identifies the receptor population and potential exposure routes for each property associated with the site.

Soil

- Prevent direct ingestion / contact with contaminated soil impacted by ExxonMobil's historic operations.
- Prevent inhalation of or exposure from contaminants, attributable to ExxonMobil's historic operations, volatilizing from contaminants in soil.
- Prevent migration of contaminants, attributable to ExxonMobil's historic operations, that would result in groundwater contamination.

See Attachment 1 which identifies the receptor population and potential exposure routes for each property associated with the site.

6.0 Recommended Remedy

This section presents the process in which the selected remedy has been evaluated in the context of existing site assessment data, and soil & groundwater data collected post IRM implementation.

6.1 Development and Analysis of Alternatives

A number of potential technologies and strategies were evaluated for their ability to meet Remedial Goals and Remedial Action Objectives (RAOs). Please note in Section 4.3(d) of DER-10, the appropriate RAS for this site dose not require a remedial feasibility analysis of the alternatives, however, we have included an evaluation of alternatives as requested by the NYSDEC in the 23 January 2004 letter and in the RAS work plan approval provided by NYSDEC dated 7 February 2006.

Table 13 presents the technologies and strategies which were evaluated for selection as a final remedy at this site. As indicated in the table, technologies were eliminated from further consideration if they were not, at a minimum, able to meet the Remedial Goals and RAOs for both soil and groundwater. If a technology or strategy was able to meet Remedial Goals and both medium specific RAOs, it was further evaluated for its appropriateness for soil and groundwater remediation, its applicability to site conditions, its ability to meet the conditions of provided future use, and finally its ability to meet the timeframe expectation. Only technologies & strategies that meet all of these evaluations of applicability were then evaluated against the seven criteria listed in Section 6.3 below. If a technology or strategy was not able to meet the evaluations in Table 13, it was dropped from further consideration.

6.1.1 IRM Results

Soil and groundwater at Lighthouse Point has seen impacts from contaminants from ExxonMobil's historic operation. The goal of the IRM was to remove surface impacts resulting from ExxonMobil's historic operations, remove the continued contaminant source of recharge to groundwater from unsaturated soil, and enhance the bio-degradation of residual hydrocarbons by the addition of oxygen and nutrients. As part of the analysis of alternative technologies and strategies, a review of the results of soil and groundwater data collected since the implementation of the IRM was completed. The historically detected impacts in groundwater prior to the IRM have indicated a declining trend and the results since the IRM indicate a continuing decline. These data are presented on Table9 and Figures 5 and 6. Prior to the implementation of the IRM, soil and groundwater data suggested that dissolved phase impacts were sourced in the impacted unsaturated soils in Areas 1, 2, and 3. Investigation results indicated that ExxonMobil attributable hydrocarbons had migrated from areas of unsaturated soil impact. That migration has been limited in extent from the suspected source areas. This illustrates that the biodegradation of the existing hydrocarbon impacts is occurring at the site. Post IRM groundwater data indicates that SCGs for groundwater are being met at the followings wells: MW-23, MW-42, MW-43, MW-44, MW-46, MW-47, and MW-50. SCG exceedences were documented at MW-45, MW-52, and MW-51.

The efficacy of the enhanced biodegradation conducted as part of the IRM is supported through three lines of evidence:

- first line of evidence - historical groundwater and/or soil chemistry data that demonstrate a clear and meaningful trend of decreasing contaminant mass and/or concentrations over time;

- second line of evidence - hydrogeologic and geochemical data that can be used to demonstrate indirectly the type(s) of natural attenuation processes active at a site; and

- third line of evidence - the evaluation of field or laboratory data that supports the occurrence of biodegradation (i.e., field or microcosm studies conducted in or with actual site media).

The primary line of evidence, the historical groundwater contaminant concentration data demonstrate that the contaminant plume size and concentrations are decreasing (see Table 9 and Figures 5 and 6).

The second and third lines of evidence, the geochemical and biological data, respectively, demonstrate that bioremedial processes are active at the site. The IRM activities were designed to enhance the bio-degradation processes. The December 2005 field and biological data (Tables 11 and 12,), indicated that the IRM activities generally increased the oxygen, nitrate and phosphate concentrations in the groundwater. The February 2006

field and biological data demonstrate that in general the oxygen, nitrate, and phosphate concentrations have decreased and the total viable and nonviable microorganisms increased. Microorganisms consume oxygen, nitrate and phosphate as they reproduce and respire. Further monitoring as identified in the IRM plan will provide additional data to evaluate the second and third lines of evidence and determine whether the enhancements improved the bio-degradation of the residual petroleum constituents. However, the primary lines of evidence clearly indicate that the petroleum hydrocarbons are being degraded.

6.2 Identification of Potentially Successful Remedies

Based on the evaluation process provided in Section 6.1 above, three potential remedies have been identified that meet site specific Remedial Goals and RAOs and site specific evaluations noted on Table 13. The areas identified in the potential remedies are shown on Figure 7 and are as follows:

- Excavation of unsaturated and saturated zone soil from areas where any impacts from ExxonMobil's operations in soil or groundwater were detected with the goal to restore the site to pre-ExxonMobil discharge conditions as required by Item 4 of Attachment D of the Order on Consent and the augmentation of bio-remediation for groundwater. (Evaluated Remedy number 10)

- Excavation of unsaturated and saturated zone soil in areas of historic ExxonMobil operations for remediation to TAGM 4046 SCGs and the augmentation of bio-remediation for groundwater. (Evaluated Remedy number 11)

- Excavation of unsaturated zone soil in areas of historic ExxonMobil operations for remediation to TAGM 4046 SCGs and the augmentation of bio-remediation for groundwater. (Evaluated Remedy number 12)

All of the above listed potential remedies will include as necessary appropriate engineering controls which may be required for final future use plans.

6.3 Consideration of the First 7 Criteria

The following provides an evaluation of the potentially successful remedies to the 7 criteria listed in Section 4.1(e) of DER-10. Each of the three potential remedies listed in Section 6.2 above will be evaluated against these criteria as a means of remedy evaluation and selection.

1. Overall Protection of Public Health and the Environment

Evaluated Remedy # 10
Excavation of unsaturated and saturated zone soil from areas where any impacts from ExxonMobil's operations in soil or groundwater were detected with the goal to restore the site to pre-ExxonMobil discharge conditions as required by Item 4 of Attachment D of the Order on Consent and the augmentation of bio-remediation for groundwater.

With this remedy, the existing or potential pathways of exposure identified in Attachment 1 of this document for all receptor populations would expect to be eliminated for surface soils and subsurface soils. Site and task specific engineering controls may be expected to be required to reduce the potential exposure of groundwater contact to construction workers during a ground disturbance. Additionally, site specific engineering controls may still be expected to be required to control existing or potential exposure pathways for the recreational user and occupational worker to indoor air scenarios as noted above as groundwater impacts above SCGs may remain for a period after the completion of the soil removal.

Evaluated Remedy #11
Excavation of unsaturated and saturated zone soil in areas of historic ExxonMobil operations for remediation to TAGM 4046 SCGs and the augmentation of bio-remediation for groundwater.

With this remedy, the existing or potential pathways of exposure identified in Attachment 1 of this document for all receptor populations would expect to be eliminated for surface soils and subsurface soils above SCGs. Site and task specific engineering controls may be expected to be required to reduce the potential exposure of groundwater and impacted soils, below SCGs, from contact to construction workers during a ground disturbance. Additionally, site specific engineering controls may still be expected to be required to control existing or potential exposure pathways for the recreational user and occupational worker to indoor air scenarios, as noted above, as groundwater impacts above SCGs may remain for a period after the completion of the soil removal.

ExxonMobil preferred remedy

Evaluated Remedy #12
Excavation of unsaturated zone soil in areas of historic ExxonMobil operations for remediation to TAGM 4046 SCGs and the augmentation of bio-remediation for groundwater.

With this remedy, the existing or potential pathways of exposure identified in Attachment 1 of this document for all receptor populations would expect to be eliminated for surface and unsaturated zone soils. Site and task specific engineering controls may be expected to be required to reduce the potential exposure to impacted saturated soils, soils impacted below SCGs, and groundwater contact to construction workers during a ground disturbance. Additionally, site specific engineering controls may still be expected to be required to control existing or potential exposure pathways for the recreational user and occupational worker to indoor air scenarios as noted above as saturated soils and groundwater impacts above SCGs will remain for a period after the completion of the soil removal.

– may be (probably will be) unacceptable to the Ft. La P. Co.

2. Compliance with Standard, Criteria, and Guidance (SCGs)
The applicable SCGs for this site are those listed in TAGM 4046 and TOGS 1.1.1

Evaluated Remedy # 10
Excavation of unsaturated and saturated zone soil from areas where any impacts from ExxonMobil's operations in soil or groundwater were detected with the goal to restore the site to pre-ExxonMobil discharge conditions as required by Item 4 of Attachment D of the Order on Consent and the augmentation of bio-remediation for groundwater.

This potential remedy would be expected to comply with SCGs in soil upon completion of soil removal and after a period of time, it is expected to achieve compliance with groundwater SCGs. Eventual achievement of groundwater SCGs will be accomplished via continued bio-degradation of residual dissolved phase petroleum impacts.

Evaluated Remedy # 11
Excavation of unsaturated and saturated zone soil in areas of historic ExxonMobil operations for remediation to TAGM 4046 SCGs and the augmentation of bio-remediation for groundwater.

This potential remedy would be expected to comply with SCGs in surface, unsaturated, and saturated soil upon completion of soil removal and similar to the above potential remedy would after a period of time be expected to achieve compliance with groundwater SCGs. Eventual achievement of groundwater SCGs will be accomplished via continued bio-degradation of residual dissolved phase petroleum impacts.

Evaluated Remedy # 12
Excavation of unsaturated zone soil in areas of historic ExxonMobil operations for remediation to TAGM 4046 SCGs and the augmentation of bio-remediation for groundwater.

This potential remedy is expected to comply with SCGs in surface and unsaturated soil upon completion of soil removal and after a period of time is expected to achieve compliance with saturated soil SCGs and groundwater SCGs. In this remedy, eventual achievement of groundwater and saturated soil SCGs will be accomplished via continued bio-degradation of residual petroleum impacts. The above potential remedy satisfies this criterion.

time frames for achieving compliance w/ SCGs is uncertain; in any event, time frames are expected to be too long to be compatible w/ Ft. LaP's re-development plans; achievement of soil cleanup objectives is not certain

3. Long-Term Effectiveness and Permanence

Evaluated Remedy # 10
Excavation of unsaturated and saturated zone soil from areas where any impacts from ExxonMobil's operations in soil or groundwater were detected with the goal to restore

the site to pre-ExxonMobil discharge conditions as required by Item 4 of Attachment D of the Order on Consent and the augmentation of bio-remediation for groundwater.

With this remedy, it is expected that there will be limited remaining impacts attributable to ExxonMobil's historic operations upon completion of the field excavation. However, in the time between the soil removal and the biodegradation of residual petroleum impacts in groundwater and potentially limited soil locations, site specific engineering controls may be required until groundwater concentrations are returned to pre-release conditions. At this time details of the future use design are not available to allow for appropriate design of engineering controls, however, standard engineering practices will be used in the design of these controls. As noted previously, the primary sources of petroleum impact from ExxonMobil's historic operations have been removed in order to confirm the remedy's ability to meet RAOs in the future.

Evaluated Remedy # 11
Excavation of unsaturated and saturated zone soil in areas of historic ExxonMobil operations for remediation to TAGM 4046 SCGs and the augmentation of bio-remediation for groundwater.

With this remedy, it is expected that there will be limited remaining impacts upon completion of the field excavation, attributable to ExxonMobil's historic operations in soil and groundwater. However, in the time between the soil removal and the biodegradation of residual petroleum impacts in groundwater and remaining soils, site specific engineering controls may be required until groundwater concentrations are returned to pre-release conditions, as discussed above. At this time details of the future use design are not available to allow for appropriate design of engineering controls, however, standard engineering practices will be used in the design of these controls. As noted previously, the primary sources of petroleum impact from ExxonMobil's historic operations have been removed in order to confirm the remedy's ability to meet RAOs in the future.

Evaluated Remedy # 12
Excavation of unsaturated zone soil in areas of historic ExxonMobil operations for remediation to TAGM 4046 SCGs and the augmentation of bio-remediation for groundwater.

With this remedy, it is expected that there will be remaining impacts upon completion of the field excavation, attributable to ExxonMobil's historic operations in soil and groundwater. However, in the time between the soil removal and the biodegradation of residual petroleum impacts in groundwater and saturated soil locations, site specific engineering controls may be required until groundwater concentrations are in compliance with SCGs, as discussed above. At this time details of the future use design are not available to allow for appropriate design of engineering controls, however, standard engineering practices will be used in the design of these controls. As noted previously, the primary sources of petroleum impact from ExxonMobil's historic operations have been removed in order to confirm the remedy's ability to meet RAOs in the future.

may (probably) be unacceptable to the Ft. L. P.Co.

4. Reduction of Toxicity, Mobility or Volume with Treatment

Evaluated Remedy # 10
Excavation of unsaturated and saturated zone soil from areas where any impacts from ExxonMobil's operation in soil or groundwater were detected with the goal to restore the site to pre-ExxonMobil discharge conditions as required by Item 4 of Attachment D of the Order on Consent and the augmentation of bio-remediation for groundwater.

The removal of impacted soil and the degradation of residual dissolved phase petroleum impacts resulting from ExxonMobil's historic operation from the site inherently reduces the toxicity, mobility, and volume of the impacts. Based upon the assessment data used to delineate the area described by this remedy, the majority of the excavated soil does not materially affect the reduction of toxicity, mobility or volume.

Evaluated Remedy # 11
Excavation of unsaturated and saturated zone soil in areas of historic ExxonMobil operations for remediation to TAGM 4046 SCGs and the augmentation of bio-remediation for groundwater.

The removal of unsaturated and saturated soil exceeding SCGs and the degradation of existing dissolved phase petroleum impacts in groundwater resulting from ExxonMobil's historic operation from the site inherently reduces the toxicity, mobility, and volume of the impacts. Based upon the assessment data used to delineate the area described by this remedy, the majority of the excavated soil does not materially affect the reduction of toxicity, mobility or volume.

Evaluated Remedy # 12
Excavation of unsaturated zone soil in areas of historic ExxonMobil operations for remediation to TAGM 4046 SCGs and the augmentation of bio-remediation for groundwater

The removal of unsaturated soil exceeding SCGs and the degradation of existing impacts above SCGs in saturated soil and dissolved phase petroleum impacts in groundwater resulting from ExxonMobil's historic operation from the site inherently reduces the toxicity, mobility, and volume of the impacts.

not completely, and not as effectively as remedy nos. 10 & 11

5. Short Term Effectiveness

Evaluated Remedy # 10
Excavation of unsaturated and saturated zone soil from areas where any impacts from ExxonMobil's operations in soil or groundwater were detected with the goal to restore the site to pre-ExxonMobil discharge conditions as required by Item 4 of Attachment D of the Order on Consent and the augmentation of bio-remediation for groundwater.

With this remedy short term potential adverse impacts and risks to the community, the workers, and the environment, are the greatest considering the volume of material to be removed. Significant efforts to control these potential impacts and risk including, traffic hazard, nuisance noise, and dust are required. Site specific engineering controls and practices will be required to control these potential adverse impacts and risks. With this remedy the time to achieve the RAOs for soils would be expected to be less when compared to the other evaluated alternatives.

Evaluated Remedy # 11
Excavation of unsaturated and saturated zone soil in areas of historic ExxonMobil operations for remediation to TAGM 4046 SCGs and the augmentation of bio-remediation for groundwater.

With this remedy short term potential adverse impacts and risks to the community, the workers, and the environment, are somewhat less than the alternative above. Significant efforts to control these potential impacts and risk including, traffic hazard, nuisance noise, and dust will likely be required. Site specific engineering controls and practices will likely be required to control these potential adverse impacts and risks. With this remedy the time to achieve the RAOs for soils would be expected to be greater than the evaluated alternative above.

Evaluated Remedy # 12
Excavation of unsaturated zone soil in areas of historic ExxonMobil operations to remediation to TAGM 4046 SCGs and the augmentation of bio-remediation for groundwater.

With this remedy significantly less short term potential adverse impacts and risks to the community, the workers, and the environment, than the two alternatives evaluated above. Efforts to control these potential impacts and risk including, traffic hazard, nuisance noise, and dust may be required. Site specific engineering controls and practices may be required to control these potential adverse impacts and risks. With this remedy the time to achieve the RAOs for soils would be expected to be greater than the evaluated alternatives above.

6. Implementability

Evaluated Remedy # 10
Excavation of unsaturated and saturated zone soil from areas where any impacts from ExxonMobil's operations in soil or groundwater were detected with the goal to restore the site to pre-ExxonMobil discharge conditions as required by Item 4 of Attachment D of the Order on Consent and the augmentation of bio-remediation for groundwater.

This potential remedy is implementable from both a technical and administrative aspect. However, of the three, this remedy has the greatest amount of technical and administrative difficulty. Based on the volume of material to be removed, this potential

remedy will consume the greatest amount of resources. All three remedies are equal in the ability to be monitored for effectiveness.

Evaluated Remedy # 11
Excavation of unsaturated and saturated zone soil in areas of historic ExxonMobil operations to remediation to TAGM 4046 SCGs and the augmentation of bio-remediation for groundwater

This potential remedy is implementable from both a technical and administrative aspect. The amount of technical and administrative difficulty is somewhat less than the above remedy.

Evaluated Remedy # 12
Excavation of unsaturated zone soil in areas of historic ExxonMobil operations for remediation to TAGM 4046 SCGs and augmentation of bio-remediation for groundwater.

This potential remedy is implementable from both a technical and administrative aspect. The amount of technical and administrative difficulty is somewhat less than the above remedy.

7. Cost

Evaluated Remedy # 10
Excavation of unsaturated and saturated zone soil from areas where any impacts from ExxonMobil's operations in soil or groundwater were detected with the goal to restore the site to pre-ExxonMobil discharge conditions as required by Item 4 of Attachment D of the Order on Consent and the augmentation of bio-remediation for groundwater.

The cost of this remedy is estimated as $7,600,000, inclusive of the amount expended on the completed IRM.

Evaluated Remedy # 11
Excavation of unsaturated and saturated zone soil in areas of historic ExxonMobil operations for remediation to TAGM 4046 SCGs and the augmentation of bio-remediation for groundwater

The cost of this remedy is estimated as $3,900,000, inclusive of the amount expended on the completed IRM.

Evaluated Remedy # 12
Excavation of unsaturated zone soil in areas of historic ExxonMobil operations for remediation to TAGM 4046 SCGs and the augmentation of bio-remediation for groundwater

The cost of this remedy is estimated as $1,900,000, inclusive of the amount expended on the completed IRM.

Due the uncertainty of future use designs, potentially required engineering control costs are not included in the above estimates. Future groundwater monitoring costs are similar for all three remedies and are therefore excluded.

7.0 Remedy Selection

Based on the above evaluation, and the information provided on Table 13, the selected remedy is (Evaluated Remedy # 12) Excavation of unsaturated zone soil in areas of historic ExxonMobil operations for remediation to TAGM 4046 SCGs and the augmentation of bio-remediation for groundwater.

This remedy provides equal satisfaction of the first four criteria above when compared to Evaluated Remedies #10 and #11. With respect to criteria number 5, *Short Term Effectiveness,* this remedy poses significantly less potential adverse impact and risk to the community, workers, and the environment than the other remedies evaluated, as discussed above. Although Evaluated Remedy #12 may require additional time to achieve RAOs for saturated soils and groundwater, this remedy does not impede the future use of the site. Specific engineering controls can prevent exposure during the anticipated construction activities for any future use. The time required to achieve groundwater RAOs is relatively equal for all three alternatives. With respect to criteria number 6, *Implementablity*, Evaluated Remedy #12 has the least amount of likely technical and administrative difficulty for implementation. Figures 8 displays the selected remedy with site soil data (both assessment and post IRM data), while Figure 9 displays the selected remedy with the provided future use plan and project groundwater data.