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Local Program Tank Supervisors
Petroleum Cleanup Program Contractors
Interested Parties

THROUGH: Michael Sole, Chief
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FROM: Tom Conrardy, PE Administrator
Bureau of Petroleum Storage Systems
Petroleum Cleanup Section 3

DATE: April 19, 1999

SUBJECT: Revised Policy on Establishment and Use of Milestones for Evaluating the
Operation of Active Remediation Systems in the Preapproval
Program

On November 15, 1996, I issued a memorandum with an attachment that provided an interim policy for retainage for O&M of cleanup systems in the preapproval program. Several changes to the petroleum cleanup program in the interim, and the Department's experience with the former policy, have led to the need for revision of the policy.

The former policy allowed for retainage that had been withheld for O&M of active remediation systems to be paid if a milestone progress schedule for reduction of concentrations in designated monitoring wells was established and it was subsequently demonstrated in the annual report that cleanup progress had been made by achieving an annual milestone objective. Establishing cleanup milestones was voluntary and could be done at the discretion of the designated consultant, but if milestones were not established, retainage could potentially be withheld for the life of the cleanup project. There was also a provision that one third of the retainage (5% of work order amount) could be paid if the cleanup milestone was not achieved but a demonstration was made that the cleanup system had achieved a designated level of reliable and continuous operation. The major changes from that former policy are the following:

- The establishment of milestones for long term active remediation systems is no longer optional. All sites under active remediation or starting remediation projected to last a year or longer must establish a cleanup milestone schedule for the projection of the remaining remediation time with the next O&M work order proposal submitted to the Department.
- The work order description will state that the required content of the annual cleanup status report will be contingent on whether milestone cleanup objectives have been achieved. If the annual report documents that the milestone objectives for that year have been achieved, a substantial additional evaluation of the remediation progress or need for system modification is not necessary. If the milestone objectives are not achieved, it will be necessary to include a more

MEMORANDUM

April 19, 1999

Page Two

detailed evaluation of the reasons for under-performance and a cost-effectiveness analysis to improve system performance and efficiency; and, if necessary, establish a new cleanup time estimate and milestone schedule. There will be no additional compensation for the more detailed evaluation that must be performed and included in the annual report if projected milestones have not been achieved. Payment of retainage for an O&M work order will be contingent upon whether the content of the annual report is satisfactory. This more detailed evaluation in the event of failure of the system to meet cleanup objectives is considered to be an appropriate responsibility of the contractor responsible for site cleanup. By issuing this guidance, the Department is merely formalizing what is considered to be the professional responsibility of the cleanup contractor.

- The option for receiving partial payment of retainage based on system operation time has been eliminated.
- Milestone guidance provisions for sites with free product have been included.

Attached is the revised guideline to assist in the establishment of milestone cleanup objectives to evaluate cleanup progress for operating remediation systems. This procedure should be implemented immediately. The designated contractor must make a proposal for milestone progress evaluation at the time of submittal of a work order proposal for O&M of a system. The Department (or contracted local program) staff will review the proposal and agree or negotiate changes in conjunction with the rest of the work order proposal review. The agreed upon cleanup milestone schedule, identification of designated wells, and required content of the annual status report should be formally established at the time of execution of the work order for system operation by attaching the schedule to the work order and including the annual report evaluation criteria in the work order description.

This new policy applies to new O&M work orders developed under the template system after the date of this memo. As this is a significant policy shift, we wish to avoid confusion by starting all sites with a clean retainage slate. Any previous retainage that has not been paid for O&M work orders that have been completed may be invoiced to the Department even if milestones have not yet been established for the site. Work orders now in progress may be completed and the retainage may be invoiced to the Department if all work has been satisfactorily completed. All new work orders issued after the date of this memorandum must include a milestone schedule and will be subject to the annual report evaluation requirements.

If you have any questions, please call me at (850)488-3935.

Attachment

**Procedures to Establish Milestones and Conduct Remediation
Progress Evaluation
for Preapproval Program Sites
April 19, 1999**

Periodic evaluation of remediation progress and consideration of the need to modify the remediation strategy is critical to the efficient cleanup of sites and effective use of cleanup funds. For most sites, once per year is an appropriate frequency for this evaluation, and the annual status report is the appropriate forum for the evaluation. In general, the scope and detail of the evaluation that should be performed in the annual status report should be proportional to the measured progress at cleaning up the site relative to the expected progress. The concept of "cleanup milestones" has been established in order to gauge cleanup progress and to identify general criteria for determining the level of detail that is necessary in the annual status report evaluation. "Cleanup milestones" are projected target cleanup objectives for the concentrations of several designated wells at a specified frequency (generally one year intervals).

Due to the changes in the distribution and degree of contamination that occur during the course of remediation and advances in remediation technology, all annual status reports of active remediation need to provide some level of evaluation of the progress of remediation of the site and how the cleanup system might be modified or enhanced to continue site cleanup in a more efficient and cost-effective manner. However, if cleanup milestones have not been achieved, this evaluation needs to be more detailed and possibly consider more substantial corrective action to the cleanup system. As of the date of this guidance document, all new work orders for O&M of active remedial action projected to last one year or longer must include a milestone target concentration schedule. The following discussion describes how to establish cleanup milestone target levels and determine the level of evaluation that is necessary to be included in the annual report.

A Remedial Action Plan (RAP) prepared in the preapproval program must include a projected remediation time frame integral to the selection of the remediation strategy. The schedule for site cleanup should be reviewed

and agreed to by the FDEP (or contracted local cleanup program) before the RAP is approved. For newly initiated active remediation systems, the recommended cleanup milestones that are established to evaluate cleanup progress should be consistent with the RAP evaluation which resulted in the selection of the recommended alternative and which specified the number of years to achieve cleanup completion with that alternative.

For remediation systems that had already been operating when this guidance became effective, both the projected cleanup schedule of the approved RAP and the historical cleanup progress needs to be considered. If the cleanup progress is on schedule with that predicted in the RAP, monitoring wells shall be selected and milestones shall be established based on the remaining time of remediation consistent with the RAP predictions. The most recent sampling event for designated wells should be used to establish a baseline for monitoring well concentrations and calculation of milestone concentrations for future evaluation. If the cleanup progress has not been consistent with that predicted in the RAP, an evaluation should be conducted of the efficiency and cost-effectiveness of continued operation of the existing system. If justified, the FDEP (or contracted local cleanup program) will negotiate a work order to prepare a Remedial Action Modification Plan (RAMP) for system modification. The RAMP must establish a new predicted cleanup time frame and milestone target levels for future annual system evaluation.

If free product exists, the selected remediation strategy in the RAP should include a technique for free product recovery. The initial milestone for either the first six months or year of O&M shall be to reduce free product levels to a thickness of less than .01 foot. Once free product greater than .01 foot thickness is no longer present, the results of sampling designated monitoring wells shall be used to establish the milestone schedule for future progress evaluation. The most recent sampling results available at the time of preparation of a work order proposal for the next period of O&M (once free product has been eliminated) shall be used for the baseline of milestone concentrations for the balance of the predicted remediation period.

Evaluation of cleanup progress for soil remediation is a special problem. Soil remediation progress can not be readily gauged with convenient monitoring data analogous to groundwater remediation progress. Therefore, separate milestones will not be established for soil remediation progress. Sites that have both groundwater and soil remediation systems shall base the scope of the progress evaluation that must be contained in the annual status report on progress of reduction of monitoring well concentrations relative to the milestone target levels for groundwater. Ultimately, the soil cleanup target levels must be achieved before a No Further Action proposal will be considered by the FDEP (unless remediation was initiated prior to September 23, 1997 and the responsible party chooses to complete the site rehabilitation using the provisions of Chapter 62-770, FAC, that were in effect on September 3, 1996) and a general evaluation of perceived progress of soil remediation relative to this objective should be included in the report regardless of whether groundwater milestones are being achieved. At some point it will be necessary to verify soil cleanup completion as described in BPSS-4 and other FDEP guidance documents. For sites that only have a soil remediation system, there will be no milestone target levels established for annual evaluation purposes.

The evaluation of cleanup progress shall be based on reductions in the concentrations of specified contaminants in designated monitoring wells relative to the specified milestone target levels. Of the monitoring wells that have been selected for general monitoring during remedial action, at least three shall be selected (unless there are less than three wells with concentrations above the groundwater cleanup target levels) for the annual evaluation of cleanup progress by milestone comparison. The objective in selecting wells is that they will give an overall indication of the site cleanup progress, generally on the basis of reduction of contaminant concentrations within different areas of the plume. Due to the variables involved, it is not possible to create general guidelines for well selection that will always be applicable. Judgment on the part of the consultant and FDEP (or contracted local cleanup program) technical reviewer will be the most important element in selecting appropriate wells; however, the following procedures should generally be followed.

Recovery wells should not generally be used if possible. All wells selected for this evaluation should have contamination above groundwater cleanup target levels prior to initiation of cleanup. If any of the wells selected have free product, the initial milestone should be based on product elimination only, as described above. The wells selected should generally include the well with the highest level of contamination, a downgradient well within the plume that has a relatively low level of contamination, and at least one other intermediate level contaminated well representing an area of the plume not represented by the other two wells. Depending on the size and configuration of the plume, more than three wells may be necessary to evaluate site cleanup progress relative to milestone projections. Separate plumes on one cleanup site may necessitate the creation of more than one milestone schedule. The current contaminant concentrations (from the most recent sampling data or at initiation of remedial action) of these three (or more) wells shall be used to establish the baseline of contaminant concentrations for predicting the future milestone target level objectives.

The classic pattern of reduction of groundwater concentrations for sites under active remediation is an exponential change in concentrations, with initially more rapid reduction and eventually reduced rates of reduction until further concentration reduction appears to be approaching an asymptotic level. Making a prediction of this exponential curve is problematic however. For the purpose of this procedure for determining the scope of the annual evaluation of cleanup progress, an assumption of a straight line reduction is considered adequate and has the advantage of simplicity. Therefore, in the interest of consistency, unless otherwise justified by the consultant and agreed to by the FDEP (or contracted local cleanup program), the milestone target concentrations shall be established based on a linear reduction in contaminant concentrations from the current concentrations for a designated chemical or chemical group until the groundwater cleanup target levels are achieved. For a gasoline contaminated site, total VOA (BTEX) should generally be used for evaluation of site cleanup progress. For a diesel contaminated site, total VOA as well as naphthalene should be evaluated, with reductions to the milestones necessary for both contaminant groups. (Ultimately, the cleanup

target level for each contaminant needs to be achieved to qualify for No Further Action without conditions)

Judgment may also be necessary to determine whether separate milestone schedules should be established for individual wells or one schedule should be established representing projected reduction in the average concentration for all the designated milestone wells. Generally one milestone projection schedule for reductions in the average concentration of several wells is preferable, but site-specific circumstances may make separate milestone schedules for individual wells more appropriate. Some of the circumstances which may result in this decision include:

- Multiple remediation technologies are being used for different areas of the plume (including potential remediation by natural attenuation areas) for which separate evaluations would be beneficial to gauge the effectiveness and progress of the separate technologies in their respective areas.
- The plume is significantly elongated or has an irregular shape rather than symmetrical.
- A single plume has separate areas where diesel and gasoline contamination predominate such that there may be variable progress due to the physical characteristics of the contaminants.

At the conclusion of each year of remedial action following implementation of a milestone target schedule in accordance with this memo, the selected wells shall be sampled. The sampling of these wells should be in conjunction with other regularly scheduled monitoring well sampling that is performed and should not require an additional site visit. The concentrations of the three (or more) wells will be reported in the annual status report. If the agreed upon milestone concentration(s) (either individual milestones or combined average, whichever is applicable) for that year has been achieved, the annual status report may document this fact and provide a brief overview discussion of possible methods to improve the effectiveness or efficiency of remedial action in the summary, conclusions and recommendations. If the actual concentration of the designated milestone evaluation wells is greater than the milestone target level for that year,

the following more detailed evaluation is necessary to be included in the annual status report.

Actual Concentrations Less than 20% Greater than Milestone Target Level(s)

A new cleanup time projection shall be made based on the monitoring results of the previous year. An evaluation of the factors that may be affecting remediation progress must be provided in the annual status report, including the possible existence of significant previously undetected source material, lithological conditions inhibiting the effectiveness of the remediation system, effective positioning of remediation components (e.g., sparging or groundwater recovery wells), or mechanical equipment failures, and the report should include a recommendation that the existing system should continue operating without modification with the revised cleanup time schedule or, alternately, that system modifications, supplemental assessment or source removal should be considered. If continuing operation of the existing system is recommended, the revised cleanup milestone schedule included in the report will be incorporated into the next O&M work order. The annual status report shall include a Professional Engineer certification that the recommended course of action is the most efficient and cost-effective method to proceed with site rehabilitation. If justified, the FDEP will negotiate a work order to prepare a RAMP for system modification.

Actual Concentrations More than 20% Greater Than Milestone Target Level

A new cleanup time projection shall be made based on the monitoring results of the previous year. The report shall include an estimate of the cost of continuing remediation for the more extended period of the revised cleanup time estimate and provide a description and cost evaluation of at least one alternative to modify the cleanup system for increasing efficiency. The estimated cost of the modification shall be presented along with an estimate of the cleanup time that would result and the total life cycle cost of that alternative. An evaluation of the factors that may be affecting remediation progress must be provided, including the possible existence of significant previously undetected source material, lithological conditions

inhibiting the effectiveness of the remediation system, effective positioning of remediation components (e.g., sparging or groundwater recovery wells), or mechanical equipment failures, and make a recommendation that the existing system should continue operating without modification with the revised cleanup time schedule or, alternately, that system modifications, supplemental assessment or source removal should be implemented. Switching from active remediation to monitoring of natural attenuation should be considered if the reduction of concentrations in designated wells is reaching an asymptotic level that is not significantly above cleanup target levels. The two (or more) alternatives of continuing operating the existing system for the new, extended cleanup time projection or implementing a system modification shall be compared on the basis of cost, and a recommendation included in the report of either continuing remediation with the existing system under the revised milestone schedule or preparing a RAMP to implement the recommended alternative. The status report shall include a Professional Engineer certification that the recommended course of action is the most efficient and cost-effective method to proceed with site rehabilitation. If justified, the FDEP will negotiate a work order to prepare a RAMP for system modification, or perform a Level 2 natural attenuation evaluation (in accordance with BPSS-11), or perform supplemental site assessment.

Graphical Representation is Required

A graphical representation of the comparison of cleanup milestone objectives with actual cleanup progress is a valuable visual perspective and reference of cleanup progress. A graph of this information must be included in the annual report. The FDEP has created a useful and convenient program based on an Excel spreadsheet for plotting this information. Use of this program is encouraged but contractors may plot these data with any suitable method of their choosing. The FDEP program for plotting milestone projections and actual site data may be found at the Bureau of Petroleum Storage Systems web site at www2.dep.state.fl.us/waste/programs/pcp/index.htm, or by contacting Richard Ruscito of the BPSS. Questions on the use of the program should be directed to Richard Ruscito at (850)487-3299. Anomalous data or troubling trends, such as an imminent intercept of the milestone projection line

significantly above the applicable cleanup target levels, should be explained and evaluated in the annual report even if the milestone prediction is currently being met.

At the end of each year of system operation the selection of milestone monitoring wells being used for evaluation of cleanup progress may be reconsidered for the subsequent year. This process may consist of designating for the evaluation new monitoring wells that appear to be more representative, and establishing new milestone contaminant concentration target levels for the newly designated wells. If a different combination of wells is selected, it shall be assumed the current average concentration of those wells represents cleanup progress equivalent to the previous schedule. For example, if the newly selected wells have an average concentration of 900 ppb and one year of a predicted 4-year cleanup schedule has been completed, the next milestone should be established based on assuming the site cleanup objectives will be achieved in linear fashion in three more years, meaning the cleanup milestone for the next year will be approximately 600 ppb.

The FDEP will pay the 15% retainage that is withheld on work orders for operation of remediation systems at the end of each year of remediation based on the annual report's demonstration of cleanup progress at a site relative to the milestone goals or, alternately, on a satisfactory technical evaluation and recommendation of corrective actions contained within the annual report that would result in optimal cleanup efficiency, as described previously in this memo. An insufficient evaluation contained in the annual report for a site that has not achieved the required milestone concentration reductions on the approved schedule could result in forfeiture of the retainage.