Memorandum

Florida Department of Environmental Protection

To: Petroleum Cleanup Preapproval Program Personnel, District Coordinators, Waste Program Administrators, Contractors and Interested Parties

From: Mike Ashey, Chief
Bureau of Petroleum Storage Systems

Date: January 20, 2011

Subject: **Procedures for Implementation of the Natural Attenuation Monitoring Provisions of Section 376.3071, F.S. in the Petroleum Cleanup Program, Effective February 1, 2011**

During Special Session 2010A the Florida Legislature enacted amendments to Section 376.3071(5) (c), F.S., requiring the Department of Environmental Protection (DEP) to utilize natural attenuation monitoring (NAM) strategies and to transition sites eligible for State funding assistance under the Petroleum Cleanup Preapproval Program to long term natural attenuation monitoring (LTNAM) when:

- It is cost-effective;
- The contaminant plume is stable or shrinking and confined to the source property boundaries; and
- The contaminants of concern (COCs) meet the NAM default concentrations (NADCs) in the applicable DEP cleanup rules.

LTNAM is also referred to as passive remediation. Please see Section 1, Chapter 2010-278, Laws of Florida.

The governing statute and rule have historically required that source removal be considered prior to commencement of other remedial action or natural attenuation monitoring, where it is warranted and cost-effective. If free product and/or significant areas of contaminated soil exist in the source area(s), cost-effective options for removal and proper treatment or disposal of such source material should be evaluated and considered prior to transitioning the site to LTNAM. However, it is not the intent of the DEP to require that all instances of contaminated soil detected above cleanup target levels (CTLs) be addressed prior to transition to LTNAM. A number of technical considerations related to evaluation of contaminated soil have been outlined in **Attachment A**.

LTNAM represents a new approach to risk management in the Petroleum Cleanup Program. While significant progress toward cleanup is one of the desired goals of LTNAM, it is unrealistic to expect all sites to attenuate at the same pace or to reach CTLs for all constituents in all media within any specific time frame. As further explained in section IV, the expressed goal of achieving a range of 20% to 30% or greater average reduction of all monitored COCs in all wells during the initial forty-two (42) month period may not be realistically achievable for all sites in LTNAM. Therefore, evaluation of progress should be conducted with a degree of

flexibility and include consideration of site-specific information as well as the cost-effectiveness of other options prior to making a decision to remove a site from LTNAM.

Many of these procedures have been developed to address concerns that are not specifically covered in the governing statutes and will likely undergo periodic changes as experience is gained during implementation of these procedures.

Additional provisions associated with the Legislative amendments include:

- A requirement for the DEP to evaluate the cost of LTNAM and ensure that State-funded site mobilizations for LTNAM are performed in a cost-effective manner;
- Authorization for sites that are not eligible for State restoration funding *(non-program sites)* to transition to LTNAM using the same criteria;
- Criteria for initiation or resumption of active remediation during LTNAM, including an evaluation for significant contaminant reduction after 42 months;
- A statement that nothing in this section of the statute shall preclude a site from pursuing No Further Action (NFA) with conditions;
- A requirement for the DEP to evaluate the cost-effectiveness of higher NAM default concentrations and site-specific characteristics that would adequately protect public health and the environment; and
- Clarification that if the contaminant plume is beyond the source property boundaries, natural attenuation monitoring (NAM) may be conducted in accordance with DEP rule provided the plume is stable or shrinking.

Note, the referenced statutory amendments and various criteria for LTNAM in this guidance are not intended to preclude DEP approval of NAM in accordance with existing provisions in subparagraph 62-770.690(1)(f)2., F.A.C., and BPSS-11, Natural Attenuation Evaluation Procedures, that may be less restrictive with regard to contamination beyond source property boundaries and default NADCs.

Specific procedures for implementation of these LTNAM passive remediation requirements are outlined below:

I. Sites That Have Completed Site Assessment But Not Yet Commenced Active Remediation (other than source removal)

A. Cost-Effectiveness Evaluation

It is initially assumed by default that any site that meets the LTNAM criteria outlined in section I.B below will demonstrate progress over time through passive remediation as the most cost- effective site rehabilitation option. However, the cost-effectiveness of LTNAM at sites for which a remediation system installation is in progress or recently completed prior to startup may be evaluated on a case-by-case basis considering the associated expenditures invested and the degree and complexity of the contaminant plumes on site.

B. LTNAM Site Qualification Criteria

Following completion of the site assessment and technically feasible and cost-effective source removal activities in accordance with Chapter 62-770, F.A.C., non-program contamination sites may, and State-funded sites shall commence LTNAM if they meet the following criteria:

1. The site does not meet the unconditional No Further Action (NFA) criteria of subsection 62-770.680(1), F.A.C. *(if it does, the Site Rehabilitation Completion Order should be pursued)*;
2. Free product (FP) as defined in Chapter 62-770, F.A.C., is not currently present;
3. The groundwater contaminant plume is deemed to be stable or shrinking based on assessment and/or monitoring data spanning a period of nine months or more, including at least one sampling event within the previous six months;
4. The soil and groundwater contaminant plumes exceeding CTLs are confined to the source property boundaries;
5. All of the groundwater petroleum products COCs are at or below the NADCs referenced in Table V of Chapter 62-777, F.A.C.;
6. The site does not have DEP approved Imminent Threat (IT) status; and
7. Except for prior historical data to determine if the contaminant plume is stable or shrinking, data used to evaluate the site for LTNAM have been collected under static ambient site conditions, no less than 30 days after cessation of all remediation activities at the site.

Note, it is anticipated that the BPSS will implement indoor petroleum product vapor intrusion screening procedures for eligible sites in 2011 which, depending on site-specific considerations, may require screening to determine whether soil vapors at concentrations of concern may be in contact with the foundation of on-site occupied buildings during natural attenuation monitoring and present a hazard to occupants. If vapors in concentrations of concern exist, the cost of vapor intrusion mitigation measures should be considered in a decision as to whether it is cost-effective to implement LTNAM.

II. Sites That Have Commenced Active Remediation (other than source removal)

A. Cost-Effectiveness Evaluation

It is initially assumed by default that it would not likely be cost-effective to transition sites that have already commenced active remediation (other than source removal) to LTNAM under one or more of the following conditions:

1. Less than 12 months have elapsed since the remediation system or other remediation strategy was first placed in operation or otherwise implemented. This will allow enough time to confirm whether expedited cleanup to CTLs is achievable, as the conditions at some sites are especially conducive to rapid reduction in contamination levels;

2. Regardless of the time elapsed since commencement of active remedial action, CTLs for all COCs in all key wells are projected to be achieved within no more than two quarters based on the actual contaminant concentration reduction percentages documented in monitoring reports for the prior two quarters;
3. The DEP determines based on site-specific conditions and available data that discontinuation of active remediation at the site may pose an imminent threat to human health or the environment. Sites with DEP approved IT status shall be presumed to not be a candidate for passive remediation unless a specific determination has been made by the BPSS that LTNAM is appropriate at that site; or
4. The site qualifies for or has already commenced Post Active Remediation Monitoring (PARM). These sites should follow the standard PARM schedule and reporting requirements during the first year. If at the end of the first year the site does not qualify for unconditional SRCO, decisions will be made on a case-by-case basis to continue PARM, transition to LTNAM or pursue other remedial alternatives, as appropriate.

Note, there may be special site-specific circumstances other than those listed which could justify either pursuing or not pursuing LTNAM as the appropriate course of action at a particular site. In such cases, contractors must provide specific documentation supporting their conclusion to the DEP or LP site manager for a case-by-case evaluation. In cases where consensus cannot be reached between the contractor's site manager and DEP site manager on whether or not to pursue LTNAM at a State-funded cleanup site, the issue should first be reviewed by the DEP team leader or contracted local program manager; if it is still not resolved at this level the decision will made by the Bureau Chief.

B. LTNAM Site Qualification Criteria

After active remediation (other than source removal) has been performed in accordance with Chapter 62-770, F.A.C., non-program contamination sites may, and State-funded sites shall transition to LTNAM if they meet all of the same criteria listed in section I.B and additionally they also do not meet any of the cost-effectiveness based criteria listed in section II.A.

C. Evaluation of Alternative LTNAM COC Default Concentrations

The DEP will evaluate whether alternate COC default concentrations can be used for LTNAM in a cost-effective manner that is adequately protective of public health. In the mean time, the NAM default concentrations in Chapter 62-777, F.A.C., will be used for the initial implementation.

Alternatively, there are existing provisions in subparagraph 62-770.690(1)(f)2., F.A.C. and BPSS-11, Natural Attenuation Evaluation Procedures, that may justify NAM when COC concentrations exceed NADCs under certain conditions.

III. Implementation of LTNAM/Passive Remediation

A. Initial Screening of Sites That Meet LTNAM Criteria

With the exception of sites covered by an open executed Performance-Based Cleanup (PBC) agreement, all sites that have completed the site assessment should be evaluated to determine if they meet the criteria in sections I and II for LTNAM using the most recent data available. If the most recent sampling was performed less than 30 days after any type of active remediation occurred at the site, confirmatory sampling and analysis should be conducted at least 30 days after cessation of all active remediation to verify that the concentrations of the COCs still meet the criteria prior to commencing LTNAM.

B. Contractor Selection & Site Assignment

State-funded sites undergoing LTNAM shall be subject to the same contractor selection and site manager assignment considerations as any other regular preapproval site.

C. Cost-Effective Mobilizations, Frequency of Monitoring Events & Reporting

The initial monitoring period under LTNAM specified by statute is 42 months. The specific monitoring wells, contaminants to be analyzed for, and frequency of sampling during monitoring, shall be outlined in a LTNAM plan and submitted to the DEP for review and approval unless a NAM plan has previously been submitted. For State-funded cleanup sites, if an LTNAM plan is required, a template NAM Plan should be preapproved.

Sites entering LTNAM that are subject to post-biological or post-chemical application/injection compliance verification monitoring as required by the Underground Injection Control (IUC) or other program must incorporate the applicable monitoring requirements into the LTNAM Plan.

Compared to historical NAM and PARM procedures, the objectives during LTNAM warrant less frequent sampling events, reduced requirements for licensed professional evaluation of the data, more standardized work order components and more flexibility in the coordination and scheduling of work by contractors across multiple sites. Therefore, four areas have been identified where a more cost-effective approach will be used for State-funded cleanup sites, including:

1. Elimination of the work order proposal and associated proposal preparation template cost for LTNAM plans and monitoring;
2. Reduced frequency of sampling events and associated reporting following the first year;
3. Proration of the two-person mobilization template across multiple sites (1/2 of the template cost per event); and
4. Limitation of the annual monitoring report template and associated licensed professional review and recommendations to the end of the second year, the 42 month interval, and every other year during prolonged monitoring beyond the first 42 months.

The default sampling frequency, regardless of whether a site is entering LTNAM after the assessment or transitioning to LTNAM after operation of an active remediation system, shall be quarterly during the first year to confirm that qualifying conditions are maintained. Sampling may then taper off to longer intervals of four, six and twelve months for the remainder of the 42 month period, as illustrated in the table below. If deemed appropriate, subsequent monitoring events beyond the first 42 months shall be conducted on an annual basis.

If significant prior monitoring data exist for a particular site, including but not limited to sites that have completed 12 months of PARM per section II.A.4, the monitoring frequency may be reduced based on the professional judgment of the DEP or contracted local program licensed professional. In cases where the pre-LTNAM monitoring immediately precedes commencement of LTNAM, the periodic evaluations specified in this guidance shall be based on the total combined monitoring time.

Example LTNAM Monitoring Program
(Seasonal changes in groundwater elevation should be evaluated when establishing the specific monitoring schedule to include months that have historically had the highest COC concentrations)

Year	Monitoring Interval	Monitoring Events *(months starting from 0)*	Quarterly Reports *(months starting from 0)*	Annual Reports *(months starting from 0)*
1	3 Months	3, 6, 9 & 12	3, 6, 9 & 12	n/a
2	4 Months	16, 20, 24	16 & 20	24
3	6 Months	30	30	n/a
4	12 Months	42	n/a	42
5+	12 months	54, 66, 78…	54, 78, 102…	66, 90…

D. Maintenance of Cleanup Related Infrastructure

Upon transition from active remediation to LTNAM, existing remediation systems should be prepared for long term storage (mothballed) in accordance with the manufacturer's recommendations and electrical utility accounts temporarily suspended. Where prior PARM data do not exist, it is important to perform a detailed evaluation of the site after the first six months of LTNAM to determine if the contaminant plume has significantly rebounded above NADCs or is beginning to migrate beyond source property boundaries. If the remediation system is determined not to be required after the six month evaluation, then it should be made available for re-use and may be transferred to another site if needed or proposed for surplus approval if in poor condition. Proper preapproval procedures must be followed for transfer and/or surplus of equipment from State-funded sites. If a remediation system is deemed necessary after the equipment has been removed, compatible equipment from existing State inventory can be mobilized to the site.

It is intended that all other cleanup related infrastructure remain in place until a determination can be made that it will no longer be needed at the site. Such infrastructure may include but not limited to piping, trenching, monitoring wells, recovery and treatment wells, well heads and well vaults, fencing, concrete pads and

power poles. Nothing in these procedures shall preclude a site-specific decision to remove or abandon cleanup related infrastructure prior to or during LTNAM when sufficient technical information and justification exists.

Each monitoring event tasked under LTNAM should include a provision with preapproved costs to inspect and document the condition of such infrastructure and cleanup areas of the site, including digital photographs. Reasonable costs for maintenance and repair of such cleanup related infrastructure necessary to ensure public safety and facilitate future use, as well as general upkeep of the cleanup area, including vegetation control, may be preapproved on a case-by-case basis at sites undergoing LTNAM.

E. Prioritization of Preapproval Work Orders & Task Assignments

Once a decision has been made that a site will move forward under LTNAM, all associated work orders and task assignments shall be classified as priority "two" for funding on the weekly BPSS FCO approval list.

IV. LTNAM Evaluation & Suspension Criteria

A. Failure to Meet LTNAM Qualification Criteria & Confirmation Steps

If any of the applicable criteria outlined in sections I or II are exceeded during implementation of LTNAM, appropriate actions should be undertaken. If the site appears to meet all applicable CTLs, then the steps required by rule to pursue a SRCO should be followed. However, for exceedances based only on analytical data or free product measurement, the first course of action would be to conduct follow-up confirmation sampling or measurement if there has been a large and significant change, or to wait on the results from the next scheduled monitoring event if the exceedance is relatively minor. Such confirmation data should be reviewed prior to making any decisions to stop or suspend LTNAM and pursue other actions that may include supplemental assessment, source removal or other active remediation and associated planning.

B. Evaluation of Site Rehabilitation Progress During LTNAM

As stated in section III.D, where prior post-remediation monitoring data do not exist, it is important to perform a detailed evaluation of the site after the first six months to determine if the contaminant plume has significantly rebounded above NADCs or is beginning to migrate beyond source property boundaries. After the first six months, unless there are dramatic and sustained increases in contaminant concentrations or plume migration, the next detailed evaluation of cleanup progress should be conducted after the first two years of monitoring. These data should be extrapolated to determine whether the cleanup objectives for the first 42 months of LTNAM have a reasonable likelihood of being achieved. LTNAM should generally continue unless this evaluation clearly indicates that continued monitoring will not meet the objectives.

After the site has been in LTNAM for 42 months, another detailed evaluation of all available data should be undertaken to determine if significant progress has been made towards site rehabilitation completion. The default benchmark for determination of

significant progress after the initial 42 months will be a range of 20% to 30% or greater reduction in the average groundwater concentrations of all monitored COCs in all key wells, excluding background wells. The average reduction is a simple calculation dividing the sum of all individual COC percent changes for all individual non-background wells during the monitoring period by the total number of measurements (i.e., five wells with five individual COC measurements each is 25 total reduction measurements).

However, actual reductions in COC concentrations are dependent upon numerous site-specific factors and cleanup history. It is imperative that evaluations of cleanup progress be flexible and consider all available information because the default benchmark and timeline may not be realistically achievable for all sites in LTNAM. Therefore, determinations of significant progress other than the default benchmark based on site-specific information and professional judgment of DEP staff and the contractor may be considered if approved by the Bureau Chief. In cases where consensus cannot be reached between the contractor's site manager and DEP site manager on whether or not to continue LTNAM at a State-funded cleanup site, the issue should first be reviewed by the DEP team leader or contracted local program manager. If it is still not resolved at this level the decision will made by the Bureau Chief.

C. Initiation or Resumption of Active Remediation

If the site no longer meets LTNAM criteria following confirmation sampling or if it is determined that the site is not making significant site rehabilitation progress based on the 42 month evaluation, then active remediation should be considered. Such action will be based on site-specific information and may range from a limited source removal or interim remediation event to installation or re-start of a permanent remediation system based on an approved RAP with supplemental assessment and RAP modifications as necessary. All provisions of Chapter 62-770, F.A.C., should be followed once LTNAM has been discontinued.

ATTACHMENT A

Soil Considerations for Long Term Natural Attenuation Monitoring in the Petroleum Cleanup Program

A proper characterization and evaluation of soil contaminant concentrations and distribution is warranted prior to the implementation of LTNAM in accordance with Section 376.3071(5)(c), F.S. Generally, the Level I Risk Management Options outlined in paragraph 62-770.680(1)(c), F.A.C. may be used as a guideline in determination of eligibility for LTNAM. This supplemental document is only applicable to sites which have had documented soil contamination that exceeds the applicable Soil Cleanup Target Levels (SCTLs) referenced in Table II of Chapter 62-777, F.A.C. and have not yet been determined to meet those SCTLs through additional soil sampling. Historically for circumstances in which the site assessment concluded with a determination that soil as well as groundwater contamination exist, investigation of the applicability of Level I Risk Management Options may have been deferred to the active remediation phase. However, if during the site assessment it is determined that the site meets the criteria for LTNAM for groundwater, the following supplemental considerations should be considered prior to approving the site assessment so that the site assessment can conclude with a recommendation regarding LTNAM.

I. Soil Contamination Beyond Source Property Boundaries

Any site that has confirmed soil concentrations for any contaminant exceeding the SCTLs beyond the source property boundaries is not eligible for transition to LTNAM per section I.B.4 of the LTNAM procedures until the soil contamination has been addressed.

II. Soil Concentrations Exceeding Direct Exposure SCTLs

A. If the only contaminant exceeding the direct exposure SCTL is TRPHs, one or more additional soil samples should be taken at the location(s) and depth(s) of the previous soil sample(s) and fractionation (either MADEP or TPHCWG method) performed on the sample with the result for each fraction compared to its applicable SCTL.

B. If direct exposure SCTLs are exceeded and/or TRPH fractionation did not meet the calculated SCTLs for each fraction, the site will not qualify for LTNAM until the soil contamination is addressed or unless the exceptions in Section V apply.

III. Soil Concentrations Exceeding Leachability SCTLs

A. If no soil samples exceed direct exposure SCTLs, consideration should be given to utilize the Synthetic Precipitation Leaching Procedure (SPLP) (EPA Method 1312). Any soil samples that exceed the leachability-based SCTLs, and have not had SPLP performed on the sample and the leachate analyzed, may be recollected and have SPLP extraction and leachate analysis performed to determine if the soil contamination has the potential to leach to the groundwater.

B. If one or more of the SPLP results demonstrates that the soil has the potential to leach to the groundwater at concentrations exceeding the GCTLs, a supplemental soil sample may be collected from the general soil stratum on which the contamination is present for

site-specific soil properties to determine a site-specific SCTL in accordance with procedures outlined in the "Technical Report: Development of Cleanup Target Levels (CTLs) for Chapter 62-777, F.A.C." This supplemental sample may be collected in the field at the same time as the samples for SPLP extraction and leachate analysis, and be performed only if the leachate results exceed the GCTLs.

C. If the soil contaminant concentrations are below the site-specific SCTLs or SPLP extraction and leachate analysis determines that the soil contamination does not have the potential to leach into the groundwater, LTNAM should be initiated.

D. If the soil exceeds the site-specific SCTLs and SPLP extraction and leachate analysis determine that the soil contamination has the potential to leach into the groundwater, the site will not qualify for LTNAM unless exceptions, as outlined in Section V can be made.

IV. Soil Contamination in the Smear Zone

If soil contamination is only present in the smear zone, the viability of LTNAM should be determined on a case-by-case basis based on the probable effect the contamination will have on groundwater concentrations. Historical evidence of leaching during periods of groundwater depth fluctuations should be evaluated, and if little or no evidence of leaching is observed, the site should initiate LTNAM. If it is evident the contamination present in the smear zone has a direct effect on the groundwater concentrations, appropriate measures to remediate the smear zone contamination should be taken.

V. Exceptions for Allowance of Initiation of LTNAM When Soil Contamination is Present

A. If the soil contamination is not accessible at this time for remediation (i.e., it is adjacent to or under tanks, a building or other structure) but will be at some point in the future, the site should implement LTNAM as an interim procedure until soil remediation may occur.

B. If the volatile contaminants (BTEX and MTBE) exceed the leachability SCTLs and do not pass SPLP and exceed the calculated site-specific SCTLs based on soil properties, but the concentrations are at a level where degradation will possibly occur over time then case-by-case judgment can be used to begin LTNAM. This determination must be agreed upon by both the consultant project manager and PE/PG and the BPSS site manager and PE/PG. The table below is a guide for recommended values at which concentrations below listed values could potentially attenuate:

COC	Leachability SCTL (mg/kg)	Decision Level (mg/kg)
Benzene	0.007	0.028 (or 4X alternative SCTL)
Toluene	0.6	1.2 (or 2X alternative SCTL)
Ethylbenzene	0.5	1.0 (or 2X alternative SCTL)
Total Xylenes	0.2	0.4 (or 2X alternative SCTL)
MTBE	0.09	0.36 (or 4X alternative SCTL)

VI. Cost-effective Remedial Alternatives

The following remediation techniques may be considered in an effort to have the soil contamination meet SCTLs or other end points discussed above:

A. Small source removal with extents defined by the methods above;

B. Short-term SVE events;

C. Chemical/biological injection; and

D. Wind turbine powered or solar powered bioventing - This option could be performed in conjunction with LTNAM as there will be no electrical costs and minimal operation and maintenance costs. It is only recommended for volatile contaminants (BTEX/MTBE).