GRU DNAPL Team Comments to EPA/Beazer Technology Assessment

USEPA Meeting of December 18-19, 2007

Prepared by Amy Callaway March 10, 2008

The GRU DNAPL has the following comments that are explained in further detail below:

1. Remedial measures in the surficial and intermediate aquifers must be effective in removing the downward DNAPL head in order to prevent on-going downward migration of DNAPL.
2. The extent of the DNAPL migration in the surficial and intermediate aquifers has not been fully delineated. More complete delineation is needed before or during the final remedy implementation to assure that remedial goals are achieved.
3. Performance Assessment Metrics and specific remedial goals should be defined for each alternative subsurface component as part of the FS.
4. Performance Assessment should include additional wells to more completely define the extent of the dissolved plumes, and to verify that the existing plumes are stabilized or shrinking.
5. We have additional recommendations with regard to the remedial alternatives presented

1. Remedial Measures to prevent On-going Downward DNAPL Migration

The potential for on-going downward migration of DNAPL, and the associated dissolved phase contamination is a primary concern, which must be addressed as part of the remediation of the site.

The root cause of the contamination of the Floridan Aquifer System is the volume and strong downward head of creosote that connects the Surficial Aquifer with the Ocala limestone (or Upper Floridan Aquifer). If remediation is to be successful, this ‘ladder’ of DNAPL must be interrupted.

It is approximately 20 m from the bottom of the Surficial Aquifer (~170 ft amsl) to the top of the Lower Clay Unit (~110 ft amsl) that separates the Ocala from the LHG, therefore the pressure head on this clay from creosote (specific gravity of HG-16D sample = 1.10) is about 200 kPa. This is apparently sufficient head to drive this viscous NAPL (40 cP at in-situ temperature) into well HG-16D (also HG-10D and HG-12D).

2. Delineation of DNAPL Zones

As discussed above, 200 kPa is apparently sufficient head to drive this viscous NAPL (40 cP at in-situ temperature) into well HG-16D (see Table 12 of the September 2004 Data Report for Additional Investigation of Hawthorn Group DNAPL Source Evaluation for the Koppers Industries Properties). That means that there was, and probably still is, mobile creosote in the LHG. However, the pressure head in the Surficial Aquifer is much lower due to the significantly lower head that the creosote can exert on a well screen – perhaps just one meter of head difference (not 20) with a consequent decrease in pressure head to around 10-20 kPa. This may explain why none of the monitoring wells in the Surficial Aquifer had measurable amounts of creosote when tested during 2007 (2007 First Semiannual Stage 2 Groundwater Monitoring Report, August 15, 2007).

Therefore, one cannot conclude that there has not been appreciable off-site migration of creosote DNAPL in the Surficial Aquifer, or any aquifer, simply because DNAPL is not entering wells. As shown in the Review and Recommendations report (February 2006), there is strong evidence in the dissolved-phase database that creosote DNAPL migrated off-site to ITW-21, which displayed 5,570 µg/L of naphthalene when it was plugged and abandoned in February 2004 (Review and Recommendations report, p. 4-39 and Figure 4-8) and to various wells in the UHG and the LHG (HG-4S, HG-4I, HG-4D, HG-6D, and HG-26S for example).

3. Performance Assessment ‘Metrics’

Specific remedial goals should be defined for each alternative subsurface component. There is probably a preferred goal, and lesser but still acceptable goals. Goals need not be the same for all components, and would probably also be different for different remedial alternatives. Goals may be strictly quantitative, such as meeting groundwater criteria at a specific compliance point; or semi-quantitative, such as removing mobile DNAPL to the extent practicable.

The subsurface components specified in the FS should include the following:

DNAPL - Surficial Aquifer

DNAPL - Upper Hawthorn

DNAPL - Lower Hawthorn

DNAPL - Upper Floridan *(not currently being considered)*

Groundwater - Surficial Aquifer

Groundwater - Upper Hawthorn

Groundwater - Lower Hawthorn

Groundwater - Upper Floridan

Goals for each alternative for each subsurface component, to the degree that they are different, need to be defined.

A rigorous monitoring network, monitoring schedule, and conservative triggers (MCLs, GCTLs, and conservative organoleptic criteria) should be used to assess performance of the remedy. Hydraulic containment in the Upper Floridan Aquifer may be required depending on analytical results from the proposed onsite wells downgradient of FW-12B, and results of low-rate pumping at FW-6 and FW-21B.

Similarly, whatever method is chosen to attain the reduction in DNAPL seepage to the LHG must also be amenable to quantitative performance assessment (PA). Consequently, the PA issue that concerns us is how do we determine if the supply of creosote DNAPL to the LHG has been cut off and, by implication, to the Ocala limestone as well. Given that it is impractical to measure the pressure head in the creosote, it is therefore not feasible to determine directly if the vertical ‘ladder’ of DNAPL has been severed by remedial actions. For this reason it is necessary that EPA be prepared to initiate hydraulic capture in the Floridan using robust groundwater extraction methods. EPA and Beazer should consider using Partitioning Interwell Tracer Tests (PITT), or similar methods, to investigate the distribution and mass of DNAPL in the Hawthorn.

As set out in the meeting minutes, compliance points have not yet been set for any of the groundwater components (i.e. Surficial Aquifer, Upper Hawthorn, Lower Hawthorn, and Upper Floridan). The property boundary is commonly a presumptive point of compliance. There is already evidence of site-related contaminant migration, some above criteria, beyond the site boundary in the Surficial Aquifer, the Hawthorn, and the Floridan. At a minimum, Florida GCTLs (and in some cases, more stringent criteria - phenols for example) should be achieved at the property boundary. Additional points of compliance, should establish that unaffected areas below the Koppers site remain unaffected (demonstrating that the plume is not continuing to spread) and currently-affected areas show a decline in concentrations (indicating that remedial measures are working). The eventual goal in the Floridan should be reaching GCTLs, MCLs, and other criteria throughout the Floridan.

4. Monitoring Wells for Performance Assessment

The proposed performance criterion for all of the alternatives for the groundwater components appears to be based on demonstration that "the existing groundwater plume is not expanding". This will be a key requirement of performance monitoring. It is only possible to demonstrate that a plume is not expanding with monitoring locations situated at the leading edge of the plume. It is possible for contaminant concentrations closer to the source zone to be stable or even declining while the plume advances at the leading edge. At the present time, there are insufficient monitoring locations to identify and monitor the leading edge of the plumes in the different groundwater zones.

5. Review of Remedial Alternatives

The contaminated areas of the Floridan Aquifer should be actively remediated. Alternatives 1-4 provide this as a contingency. Only Alternative 5 includes Chemox of hot spots. None of the alternatives include pump and treat (with the exception of the low-rate extraction test in FW-6 and FW-21B being proposed at this time). We believe that pump and treat should continue to be considered. We are particularly concerned about the contamination detected in FW-12B (increasing naphthalene with depth).

Excavation of DNAPL-contaminated areas in the surficial should continue to be considered. Excavation is only included in Alternative 6, which specifies excavation of the surficial and shallow UHG. Although this would be ideal, we understand that EPA is likely to negate this alternative due to cost. We concur with ACEPD's comment that excavation of more limited DNAPL-impacted areas in the surficial should be considered. Treatment of other DNAPL-impacted areas may also be required. Also, EPA and Beazer should clarify the boundaries of areas to be remediated.

As we understand it, Alternative 0 is presented for comparison purposes and is not being seriously considered.

Alternative 1 will not prevent creosote DNAPL from continuing to migrate into the LHG. Based on the testing done at the Koppers site to date as well as experience at other sites, passive DNAPL recovery wells appear to have a very limited range of influence for recovering creosote DNAPL. Based on the limited ability of this technology to remove DNAPL, it could not be expected to effectively cut off the DNAPL driving head from the DNAPL source zones in the surficial aquifer. As was shown in a study of creosote DNAPL migration at the Koppers site in British Columbia, creosote may continue 'creeping' for 40+ years following its disposal due to its high viscosity and density (Jackson et al, 2006, Migration of viscous NAPLs in alluvium, Canadian Geotechnical Journal, 43:694-703).

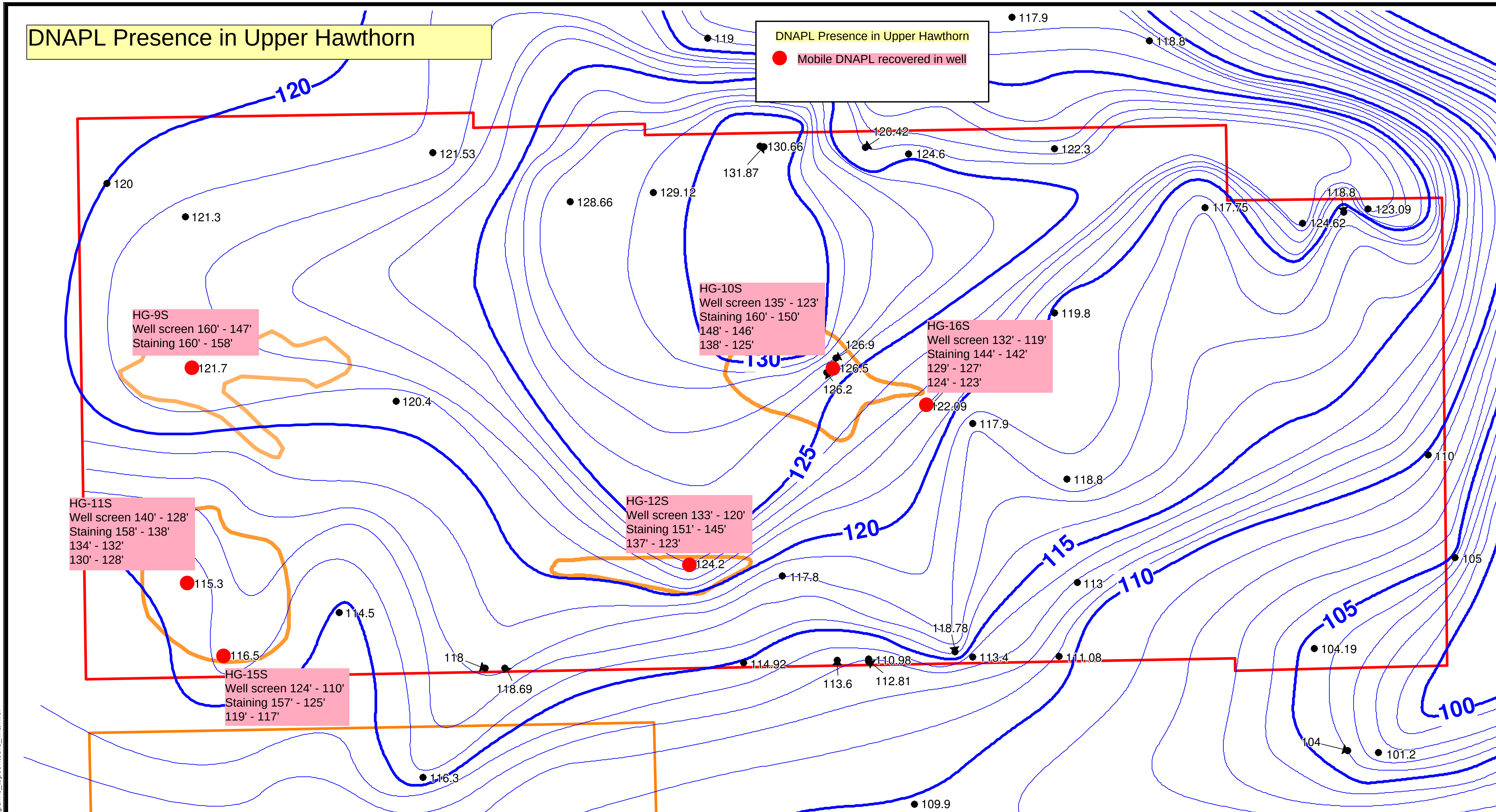
Alternative 2 provides some improvement over Alternative 1 in that it specifies "active DNAPL recovery" from the UHG, and surface covers that should reduce infiltration. However, Alternative 2 includes no attempt to remove DNAPL from the Surficial Aquifer which is an essential part of any solution to this problem. We do not know whether it has been established on a field scale that the reduction in contaminant flux achieved by ISBS is maintained over the long term, and that it is a permanent remedial alternative. For example, will the manganese dioxide crust produced in the oxidation process be degraded if reducing geochemical conditions develop again in the creosote source zones? EPA and Beazer should assess this eventuality and possible contingencies before making a final selection of remedial alternatives. EPA and Beazer should research these new developments before making a final selection of remedial alternatives.

Alternative 3 is similar in scope to Alternative 2.

Alternative 4 assumes that in-situ solidification can trap the creosote DNAPL in place. We have modified maps of boring and well locations provided by GeoTrans and provided them as attachments to this document, to show where evidence of DNAPL was observed. EPA and Beazer should clarify where in-situ soil solidification will be implemented. That comment applies to all remedial alternatives for the Surficial and the Hawthorn. Secondly, we strongly suspect that the creosote DNAPL has migrated offsite and to the east of the railroad tracks, therefore certain areas might not be amenable to such treatment. Do EPA and Beazer intend to implement in-situ solidification offsite?

Alternatives 5 and 6 provide a more aggressive approach to remediating the site. We look forward to reviewing revisions to these alternatives that EPA and Beazer are preparing after FS Meeting #3.

The FS should include an evaluation of what secondary remedial alternatives may be employed if the selected alternatives fail to meet remedial objectives. The FS should also include an evaluation of how implementing one set of remedial technologies may limit the ability to implement other alternatives at a later date.



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Explanation

114.5 Well location with clay unit elevation, in feet above msl

120 Clay surface contour elevation, in feet

Former Source Area

0 215 430

SCALE IN FEET

W S N E

TITLE: Elevation Contours for Top of Hawthorn Group Deposits -- Middle Clay Unit

LOCATION: Gainesville, Florida

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	JRE	FIGURE:
DRAFTED	KDO	5
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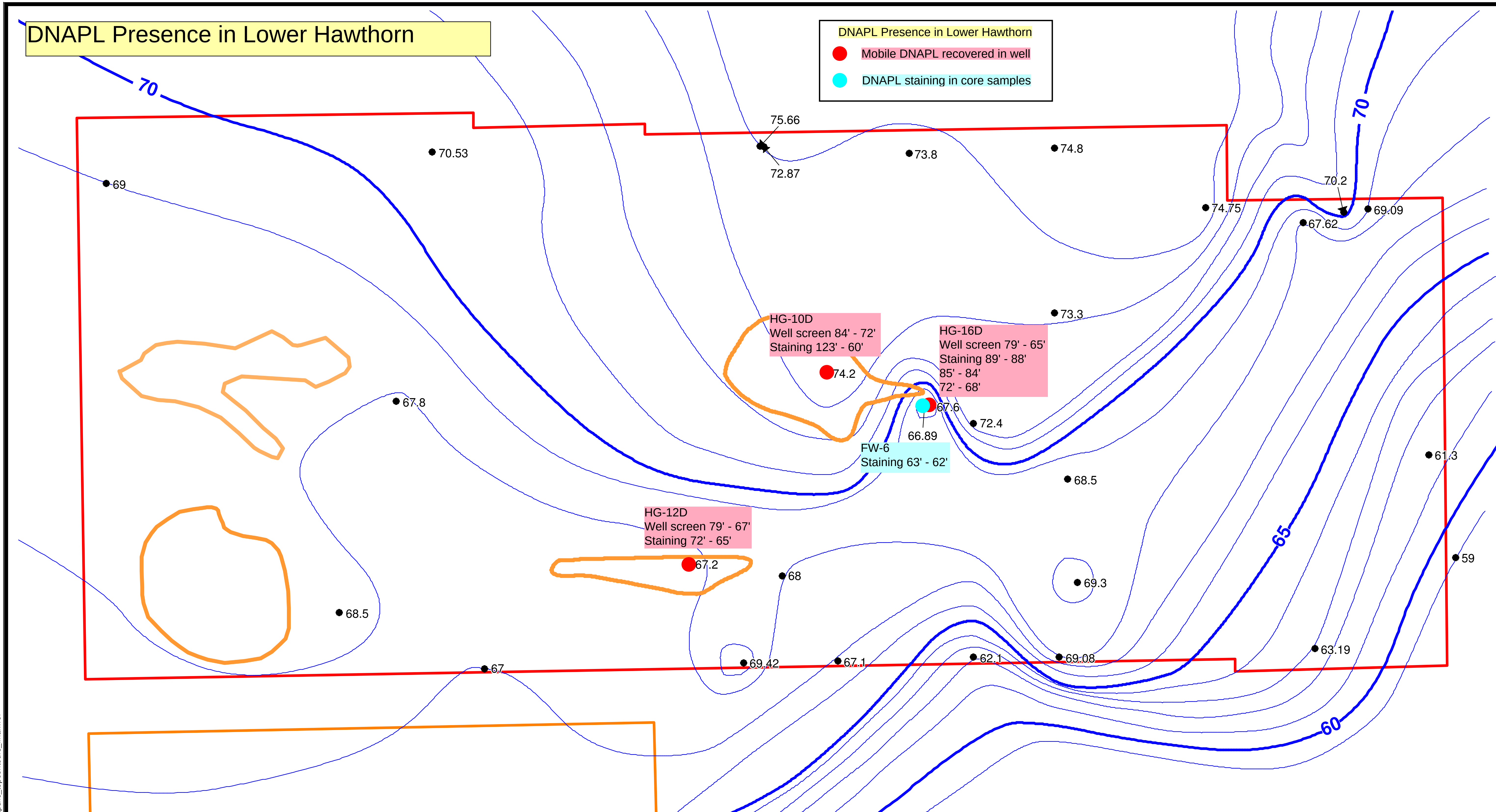
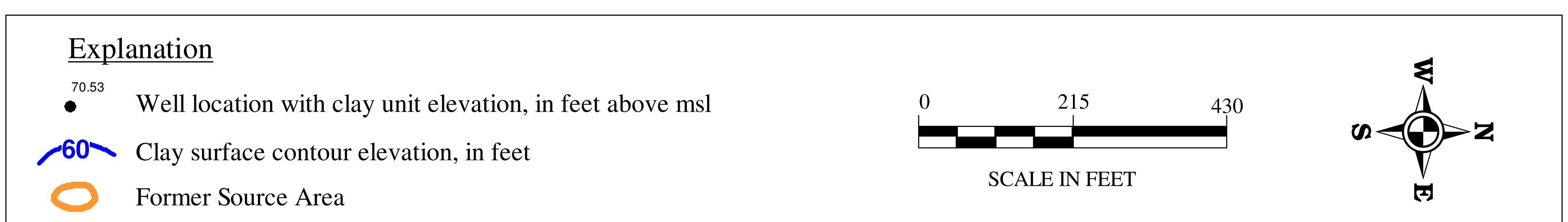
DATE	2/26/2008	





TITLE: Elevation Contours for Top of Hawthorn Group Deposits -- Lower Clay Unit

LOCATION: Gainesville, Florida

GeoTrans, Inc. A TETRA TECH COMPANY

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DATE	2/26/2008	

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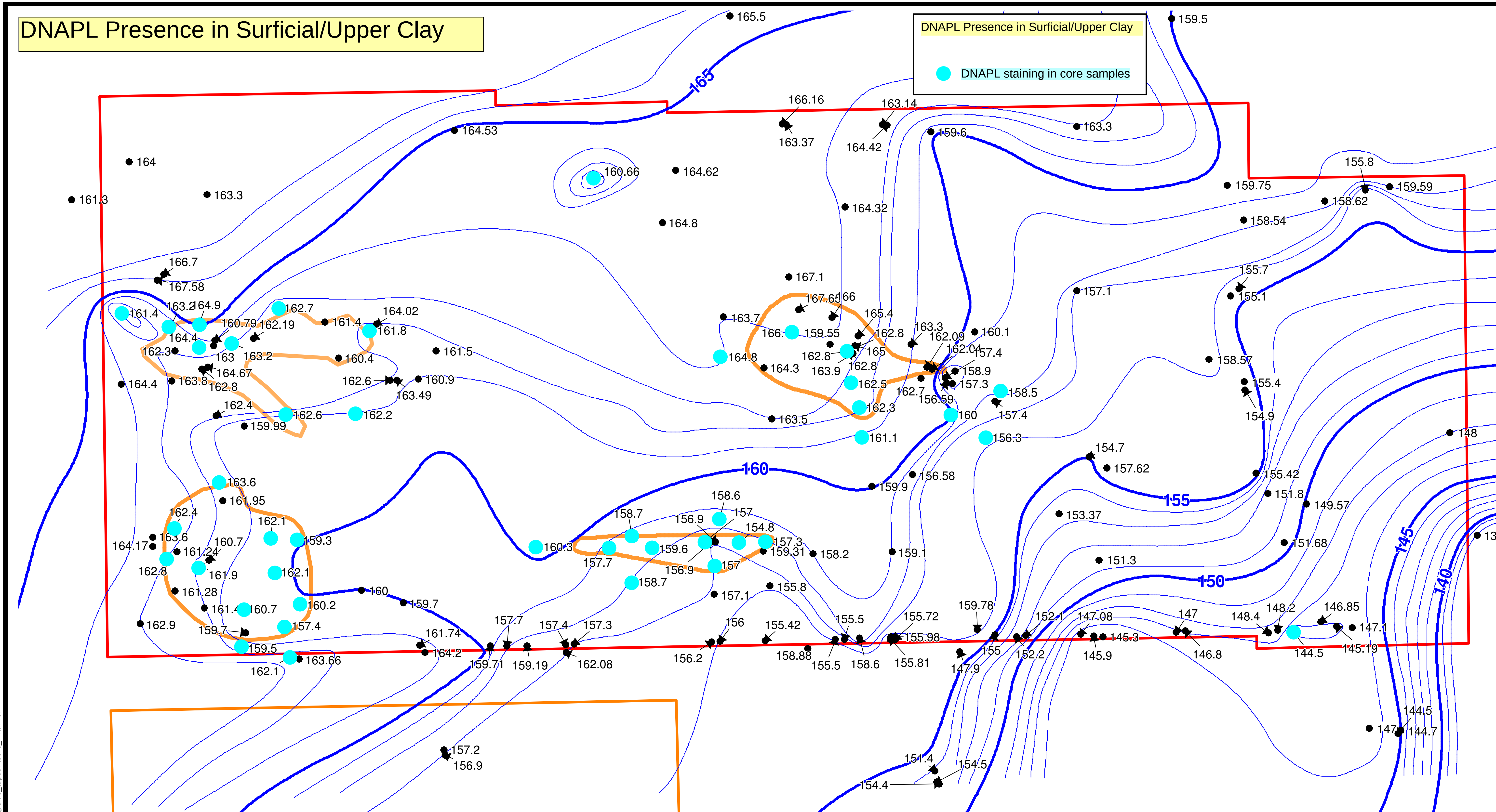

Explanation

160.3 Well location with clay unit elevation, in feet above msl

160 Clay surface contour elevation, in feet

Former Source Area

0 215 430

SCALE IN FEET

W N E S

TITLE: Elevation Contours for Top of Hawthorn Group Deposits -- Upper Clay Unit

LOCATION: Gainesville, Florida

GeoTrans, Inc. A TETRA TECH COMPANY

CHECKED	JRE	FIGURE:
DRAFTED	KDO	2
FILE	UC_TopContours.wor	
DATE	2/26/2008	

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