Report of Results

Environmental Testing Program

Belcher Foundry

April 2005

Prepared For:

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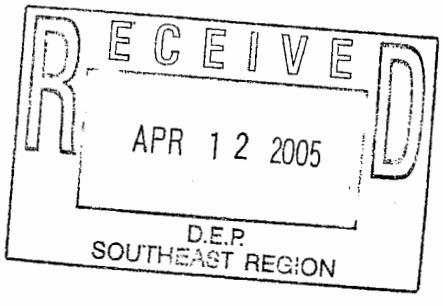

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1.0 SUMMARY OF RESULTS

1.1 Introduction

Belcher Corporation LLC (Belcher) operates a green sand foundry (Foundry) located at 558 Foundry Street, South Easton Massachusetts. The Foundry is the subject of an Administrative Consent Order (ACOP-SE-04-7003) with the Massachusetts Department of Environmental Protection (DEP) Southeast Regional Office. The effective date of this ACOP was September 21, 2004. Item V.4., of the ACOP, required Belcher to conduct an environmental sampling program. Earth Tech has coordinated this environmental testing program, pursuant to the Scope of Work provided in Attachment 1. Summaries of the principal findings of this testing program are provided in this summary text. The Foundry reported operation at higher than typical production levels for purposes of the testing.

1.2 Dust/Particulates

Emission testing for particulate matter was conducted by CK Environmental (CKE) on December 14 and 15, 2004 on the outlet of 3 dust collector units. A copy of CKE's detailed test report is provided as Attachment 2. A summary of the results is as follows:

Pangborn: This unit treats the exhaust from the metal melting furnaces, and is located outdoors at southeast corner of the Foundry Building. The particulate matter test results for the Pangborn were 0.0016 grains per dry standard cubic feet (gr/dscf) and 0.088 pounds per hour (lb/hr). These are well within the DEP approval limits for this unit of 0.013 gr/dscf and 2.0 lb/hr.

AAF: This unit treats the exhaust principally from the Disa shakeout conveyor, and is also located outdoors at southeast corner of the Foundry Building. The Disa line is the principal pouring and casting line at the Foundry. The particulate matter test results for the AAF were 0.0081 gr/dscf and 1.91 lb/hr. The outlet concentration is a little above the DEP approval limit of 0.007 gr/dscf. It should be noted that the testing was done with high production rates for testing purposes, so these results are not necessarily indicative of a typical Foundry operating day. The lb/hr is below the DEP approval limit of 2.4 lb/hr.

Fuller: This unit treats the exhaust from the Disa sand system. This unit is located outdoors on the south side of the Foundry Building. The particulate matter test results for the Fuller were 0.0041 gr/dscf and 0.69 lb/hr. The Fuller dust collector was installed as a replacement of a prior sand system dust collector; the relationship of the test results to DEP requirements needs to be determined.

The CKE testing also included analysis of samples from the three dust collectors for selected trace metals and particle size estimates. The selected trace metals were found to be a very small fraction of the overall dust collector particulate emissions. The average particle size ranged from 2 microns for the AAF to 3.7 microns for the Fuller. Additional details may be found in Attachment 2.

With respect to the conclusions of the particulate testing, further investigation of how to bring the AAF under the grain limit is needed. The Fuller permitting status also needs resolution. We don't believe that these dust collector test results are a primary explanation of the local dust/particulate fallout issues reported in the vicinity of the Foundry.

Our review of the estimated air balance for the Foundry as well as observation of Foundry operation has resulted in our recommendation to control of fugitive emissions concentrated on the southwest and south sides of the plant.

The Foundry air balance is characterized by a number of fresh air makeup fans, which deliver an estimated total air flow of 227,000 actual cubic feet per minute (acfm) of fresh air directed into the Foundry. Foundry air exhausted via the Pangborn, AAF, and Fuller dust collectors, as well as a fourth dust collector (referred to as Wheelabrator or metal finishing unit). The Wheelabrator dust collector treats ventilation exhaust from the metal finishing area. There is also one direct exhaust fan on the roof in the southwest area of the Foundry. The total of exhaust air flow measurements/estimates for these discharges is approximately 90,000 acfm. This leaves approximately 137,000 acfm as the estimated fugitive airflow exhausting from the Foundry. This includes several small exhausts from various equipment which we have lumped into the fugitive exhaust category.

Our recommended dust mitigation strategy is to seal off sources of fugitive exhaust to the maximum extent practical, and to install a new dust collector on the southwest side of the plant. This dust collector would also be useful to control various process sources associated with heat treating and quenching operations. The sizing of this dust collector is a key consideration in order to provide for adequate ventilation of the plant. The estimated plant air balance suggests there may be up to 154,000 acfm of uncontrolled fugitive exhaust emissions (including the one roof fan exhausting to atmosphere). However, this value is primarily based on the estimated performance of various fresh air makeup fans, which is subject to some uncertainty. Also, the ultimate goal of the odor/organics strategy (which would occur as necessary in a second phase of mitigation as discussed below) is to redirect the Torit discharge to atmosphere, thereby reducing the amount of fresh air ventilation needed for indoor air temperature control. Therefore, we believe a reasonable sizing for the new dust collector in the southwest corner of the plant is nominal value on the order of 50,000 acfm.

The elimination of fugitive emissions from the plant (to the extent practical) is an important mitigation strategy not only for dust control, but also to achieve adequate dispersion of residual odors and organics. These issues are discussed in more detail below.

1.3 Odor Investigation

An odor investigation for the Foundry was conducted by Dr. Ned Ostojic of Odor Science & Engineering (OS&E) on December 8 and 9, 2004. A copy of the OS&E study report may be found in Attachment 3. Odor surveys were conducted on several occasions, and an odor emission inventory was conducted. The odor survey conducted on the morning of December 8 did detect odor intensities up to 3 within 1000 feet of the Foundry on December 8, but did not detect odors on December 9. On December 8, foundry related odors were recognizable (at an intensity of 0.5) approximately 2/3 of a mile from the Foundry, but were not recognizable on December 9. An explanation of odor intensity levels may be found in the OS&E report (Attachment 3).

The odor inventory concluded that the Disa cooling line is a major contributor Foundry odor emissions. The Disa cooling line is the initial conveyor where cooling of the molds occurs after they are poured. The Disa cooling line is principally ventilated by an exhaust system and is treated by the Torit dust collector, which then exhausts back into the Foundry. Some initial emissions immediately after pouring discharge directly into the Foundry indoor air. OS&E recommends that a reduction in the Foundry odor source strength of 45 percent would be a reasonable neighborhood target mitigation level, based on the odor survey results from December 8-9.

OS&E also suggests a range of odor mitigation measures that can be considered, which includes taller stacks, AO (process modification), thermal oxidation, biofiltration, carbon adsorption (dry scrubbing),and wet scrubbing.

For odor control, the proposed initial (Phase 1) mitigation is the installation of AO technology. AO involves a process modification in the system for producing the green sand molds, which has been shown to reduce the amount of organics formed from pouring green sand molds. AO is a very cost effective process modification that we believe has the potential to provide odor/organics control benefit. While it recognized there is some uncertainty in how much odor/organics reduction will result with AO, we believe the combined cost and emission benefits warrant its application to the Belcher Foundry. The particulate control mitigation and Phase 1 exhaust improvements will also provide odor dispersion benefits. After installation of AO, further evaluation of remaining odor emissions, along with the need for any additional odor mitigation, can be considered in combination with the additional evaluation of trace organics emissions, as discussed below.

1.4 Trace Organics

Emission sampling for trace organics was conducted at various indoor air locations within the Foundry, as well as in the exhaust emission of the Pangborn, AAF, and Fuller dust collectors. The sampling was conducted on December 8, 2004 by CKE, and the sample testing was performed by Alpha Analytical. The detailed test results are provided in Attachment 4.

In general, for a number of the trace organics detected, we found a relatively uniform concentration level in the Foundry indoor air samples as well as the dust collector exhausts. We suspect this is indicative of pollutant emissions generated primarily by the initial Disa cooling line, the exhaust of which is primarily ventilated to the Torit dust collector and returned to the Foundry indoor air.

Foundry emission rates were calculated for Clean Air Act regulated Hazardous Air Pollutants (HAPs), as well trace organics referenced in the DEP's *Revised Air Guidelines* (December 6, 1995). The Foundry emission rates were based on the estimated Foundry air balance as discussed in Section 1.2 above. These emission rate calculations are also provided in Attachment 4.

With respect to HAPs, the conclusion of the emission calculations is that the Foundry is well below the major source thresholds for the HAPs at the levels identified in the testing. The major source threshold for HAPs is 10 tons per year (tpy) potential emissions for any single HAP, and 25 tpy of all HAPs combined. (It should also be noted that HAPs also include the selected trace metals tested (except zinc). While the dust collector outlet emission rates of the metals are very low, the testing program scope did not include overall emission estimates of trace metals from the Foundry.)

With respect to the DEP's *Revised Air Guidelines*, based on the ratio of emission rates to the DEP's Threshold Effects Exposure Limits (TEL) and Allowable Ambient Limits (AAL), we identified the controlling trace organics for evaluation in the dispersion modeling analysis. The TELs refer to maximum allowable 24-hour average *exposure* limits, and the AALs refer to maximum allowable annual average exposure limits. It should be recognized that the TEL and AAL levels are DEP guidelines, and do not actually represent specific regulatory limits in the same way as do the Federal and Massachusetts Ambient Air Quality Standards.

The three controlling trace organics as identified by this evaluation are benzene, 1,3-butadiene, and tetrachloroethene (also known as perchloroethylene or PCE). Benzene has been identified as a pollutant potentially released during foundry pouring and casting operations. It is suspected that the initial Disa cooling line is the primary source of benzene. 1,3-butadiene is hydrocarbon we suspect would have a similar emission mechanism as benzene.

PCE is a chlorinated hydrocarbon, and a cleaning/degreasing solvent. We do not suspect PCE is generated in any appreciable quantity by the Disa cooling line. The indoor air samples for PCE indicated general concentration levels in the Foundry of < 50 parts per billion (ppb), except for one sample in the northwest section of the Foundry at a level of about 300 ppb. PCE was only detected in one stack discharge (the AAF) at 20 ppb. Further investigation indicated that PCE is in fact used as a cleaning/degreasing solvent in the Foundry. Our recommendation mitigation for PCE is use of an alternate cleaning formulation.

With respect to 1,3-butadiene and benzene, our environmental testing program was designed to provide initial screening for a wide range of compounds. This program was not designed to provide specific details on the particular emission pattern of 1,3-butadiene and benzene, and how best to arrange the ventilation system to cost effectively capture these two compounds. Further testing is recommended to establish the most cost-effective method to capture and control 1,3-butadiene and benzene.

As discussed above, we are recommending a Phase 1 odor/organics control measure, which consists of installation of AO technology. AO is expected to reduce the amount of VOC and benzene formed from pouring green sand molds. AO could also change the recommended ventilation arrangement that is best suited to capture residual 1,3-butadiene and benzene. We believe that the ultimate capture/control measures that are determined to be necessary for 1,3-butadiene and benzene will also provide adequate mitigation for other trace organics.

Therefore, our recommended mitigation for trace organics is:

- Eliminate use of PCE as a cleaning solvent;
- Install AO technology for the green sand system; and
- After installation of AO, conduct further testing for trace organics to determine the most cost effective way to capture/control residual trace organics.

1.5 Dispersion Modeling

Dispersion modeling is the recognized technique for predicting ambient concentrations in the vicinity of a source based on current or future emissions. Dispersion modeling has been conducted to evaluate the effectiveness of the recommended Phase 1 controls and Foundry exhaust configuration arrangement to control odors. The dispersion modeling has been conducted by Earth Tech under the direction of Dr. Lloyd Schulman.

The dispersion modeling has been based on the following Phase 1 exhaust/control scenario:

1. Seal off sources of fugitive emissions and install a new dust collector on the southwest side of the Foundry with an exhaust stack 20 meters tall (65').

2. Reconfigure the exhaust stack for the Pangborn dust collector to discharge upwards at an exhaust height of 35 feet.

3. Reconfigure the exhaust stack for the metal finishing dust collector to discharge upwards at an exhaust height of 25 feet.

4. Increase the Fuller exhaust height to 25 feet.

5. AO technology is able to achieve a 45 percent overall reduction of Foundry odor emissions.

The results of the odor dispersion modeling indicate that there will be approximately 7 hours each year where odor intensity levels could reach the nuisance level. This corresponds to less than 0.1 percent of the hours in a year, and represents a significant improvement over the current frequency of odor nuisance conditions. The details of the dispersion modeling study are provided in Attachment 5.

After AO is installed and additional testing is conducted, and recommended capture/control measures for 1,3-butadiene and benzene are determined, additional dispersion modeling will be needed to determine the optimal exhaust configuration to allow for suitable dispersion of residual trace organic and odor emissions.

1.6 Noise

A noise evaluation of the Foundry was conducted by Mr. Doug Bell of Cavanaugh Tocci Associates. This noise evaluation included a program of ambient sound measurements in the vicinity of the Foundry. The findings of the noise evaluation are that the Foundry is in compliance with the DEP Noise Policy. Cavanaugh Tocci's noise report is provided in Attachment 6.

1.7 Neighborhood Observations of Dust, Odor, and Noise

In mid-November 2004, a toll-free phone number was made available to residents in the vicinity of the Belcher Foundry to report observations of dust, odor and/or noise in conjunction with the environmental testing program. A total of 19 calls were received from November 11-18, 2004 through January 31, 2005. Observations of odor were reported in the vast majority of the calls (16 of 19). Particulate issues, either alone or in combination with odor, were mentioned in almost half of the calls (7 of 16). Noise was mentioned (in combination with odor and particulates) in two calls. No calls were received during either the onsite odor study (12/8 or 12/9/04) or the noise fieldwork (1/05).

A summary of weather observations associated with the dust, odor and noise observations was also compiled. These weather observations were from Taunton Municipal Airport, which is located approximately 11 miles southeast of the Foundry. The observations of odor generally correlate with lighter wind to moderate wind speeds. The wind direction was generally consistent with a general wind direction from the Foundry to the observer. The location of the Taunton Airport 11 miles from the Foundry does limit the correlation of wind direction, especially at low wind speeds. Some of the odor observations are associated with calm observations at Taunton. In one case, odor observations were reported north of the Foundry on one day with strong southerly winds and rain.

The observations of particulate fallout were reported when the fallout was observed, not specifically when the fallout was occurring. The weather conditions observed prior to the observations of particulate fallout either included some period of winds from the Foundry to the observer, and/or calm winds. In either case, these observations are consistent with potential transport of particulates from the Foundry to the observer.

The phone call log, summary of associated weather observations, and an aerial photograph showing the locations of the observations is provided in Attachment 7.