F T . W O R T H L E A G U E
O F N E I G H B O R H O O D S

RECOMMENDATIONS FOR POLICY CHANGES FOR GAS DRILLING NEAR SCHOOLS

February, 2011

Fort Worth League of Neighborhoods Report to ISD

February 22, 2011

Dear Parents, FWISD Board Members and FWISD Administration:

As I am sure you are well aware, many of the neighborhoods within Fort Worth have struggled for the past few years with the growing natural gas development in our midst. Drilling is a complex issue, particularly in an urban setting and particularly where schools, health facilities, neighborhoods, and facilities for the elderly may be affected. While gas well drilling can represent a significant economic benefit to many, it also brings with it an increased safety risk to all of us who live in Fort Worth. As many newspaper and television stories have portrayed, trying to understand and measure that increased risk is often difficult and contentious.

In the fall of 2010, concerned citizens brought to the attention of the League the issue of pending gas leases before the FWISD Board of Trustees. Believing that the Board could get more protective measures for school children included in the lease agreements, the League asked for (and the board agreed to) a 90 day delay on the decision so that a team of experts could review drilling and its impacts near schools. Based on their review, our team of scientists and experts versed in drilling emissions and pipeline issues has made a set of recommendations for the FWISD to consider in any future leases.

This report includes those recommendations as well as observations about how the process of gas drilling is regulated and monitored – or not – in our city and state. We believe these recommendations can be quite useful to the district as it seeks to reap the benefits of harvesting its minerals while at the same time ensuring the safety of the 80,000 children who attend FWISD schools.

We are grateful to the team of scientists and experts – Dr. Ramon Alvarez, Dr. Melanie Sattler, Dr. David Sterling, and Carl Weimer – who donated their expertise and time to the League to produce this report. We are grateful as well to Deborah Rogers, a member of the League's gas drilling committee, who has served as a tireless liaison between the League and the team. All of their efforts were made on behalf of the school children so that parents, FWISD board members and administrative staff would know what protective measures are prudent, feasible, and necessary.

Sincerely,

Libby Willis
President
FWLNA

Executive Summary

Since the first air tests were conducted in May, 2009 near a natural gas drilling site, an ever increasing concern has emerged which questions the safety of drilling activities in the area. To date, testing has been done by Texas Commission on Environmental Quality (TCEQ) and Eastern Resources Group (ERG) on behalf of the city of Ft. Worth. Private testing has also been conducted by environmental engineers, private citizens and local universities.

Carbon disulfide, a neurotoxin, was the compound of most concern in this report. It is known to cause neurological, cardiovascular, behavioral and psychotic abnormalities.

Natural gas drilling activities have the potential to cause serious health problems including a possible increased risk of cancer, heart disease, asthma and other respiratory disorders, neurological and behavioral problems. These potential risks can be greater for children than adults.

The TCEQ in their final report on emissions in Barnett Shale dated January 2010, stated that "gas production facilities can, and in some cases do, emit contaminants in amounts that could be deemed unsafe."

Many other cities in North Texas such as Flower Mound, South Lake, Grand Prairie and Dallas itself have declared moratoria or deferred permits until such time as environmental and health questions can be answered more fully.

The Fort Worth Independent School District (FWISD) last updated their policy regarding gas drilling and production in 2008, well before much new information had come to light in 2009 and 2010 questioning potential health effects of gas drilling.

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In the Fall of 2010, questions were directed toward the Forth Worth League of Neighborhoods (the "League") from concerned citizens about the FWISD consideration of mineral leases for over 40 school properties. This report has been prepared by the League to recommend measures which could lessen the risk of drilling and production activities near schools yet still allow the production of minerals.

The only activity other than natural gas operations likely to produce carbon disulfide at these high levels is the production of viscose rayon. There are NO viscose rayon plants in North Texas.

In preliminary results of the Ft. Worth Air Quality study, released on 14 February, 2011, two sites were found to be in gross violation of their permits with TCEQ. Just as importantly, neither the City nor the TCEQ was aware that these facilities were in violation.

In Texas, an "authorization" called a permit by rule (PBR) is required by TCEQ for all facilities that emit less than 25 tons per year of VOC's (volatile organic compounds). **This authorization only requires the permittee to keep records demonstrating that they are under 25 tons per year of emissions. This is interesting to note because other states such as Wyoming and Colorado require the installation of controls for emissions well below the 25 tons per year threshold. Texas does not require these controls nor does the State physically inspect every well site on a regular basis.**

In the recent Sunset Review conducted on TCEQ, it was stated that **"TCEQ's approach to compliance history fails to accurately measure [an] entities' performance, negating its use as an effective regulatory tool."**

This statement could not be evidenced better than by the two sites tested by ERG in Ft. Worth, one of which was found to be emitting as much as 100 tons of VOC's per year.

These sites were both well above the already generous limit set by TCEQ and in gross violation of their PBR's.

The levels of carbon disulfide predicted by the model in this report, greatly exceed *adult worker* short term regulatory and recommended limits. Very little information exists on how *children* might be affected because exposure to this compound would normally occur in a factory setting where children are not expected to be. When gas drilling comes to neighborhoods, this is no longer the case.

These permit violations were not suspected by either the City or the State, definitively confirming the need for independent monitoring of gas facilities and underscoring the value of independent testing in order to protect public health.

Further, although no single toxic was detected in ambient data above short term health benchmarks, several exceeded long term health benchmarks.

Setbacks of at least *one mile* are recommended in this report to adequately protect the children. Levels of carbon disulfide are predicted in the model at levels as high as 1000 times the short term health benchmarks.

This confirms that thousands of new sources of pollution (e.g. wellheads, tank batteries and compressor or processing sites) are contributing a steady flow of toxics which can

include benzene, carbon tetrachloride, carbon disulfide, formaldehyde and acetaldehyde among others. **The report states "benzene and carbon tetrachloride were key HAPs (hazardous air pollutants) at each site."**

Levels of carbon disulfide seen in the Plot 1 model near Burton Hill Elementary are almost 2 times above a threshold where ***irreversible*** effects can occur according to the American Industrial Hygiene Association.

The need for independent testing is backed up by a letter dated 7 February, 2011, in which 30 North Texas lawmakers asked Governor Perry to release emergency funds for additional 24-hour monitors to be installed around the Barnett Shale region. The lawmakers specifically cited potential health concerns and the "need for unbiased statistics" as the primary reasons for the request.

For this report, careful review of various available testing data, including data from private tests, TCEQ and data published in the Barnett Shale Energy Education Council's (BSEEC) study conducted by TITAN Engineering (an industry funded study) was made by a committee of scientific and health professionals on behalf of the League. Dispersion modeling, to predict the way pollutants might travel within the city from their source, was carried out by Dr. Melanie Sattler, Associate Professor, Environmental Engineering, University of Texas at Arlington. After assessing these models, Dr. David Sterling, Chair of Environmental and Occupational Health, UNT Health Science Center stated the predictions of the models "indicate 'potential' for risk level exposure"(See section "Dispersion Modeling").

Dr. Ramon Alvarez, Atmospheric Scientist with the Environmental Defense Fund in Austin and a member of the Fort Worth Air Quality Study Committee also advised the team on air quality and technical issues. Carl Weimer, Executive Director of the Pipeline Safety Trust in Bellingham, Washington, advised on pipeline siting and safety issues.

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Of all compounds examined, carbon disulfide, a neurotoxin, proved to be of most concern in this report. It was predicted through the model that setbacks of at least *one mile* would be needed for adequate protections. Carbon disulfide traveled out from the source at levels that were multiples above short term health benchmarks, in places exceeding these thresholds by 1000 times. (Canister results, Appendix A)

Setbacks of at least one mile were also needed for carbonyl sulfide, a neurotoxin and a byproduct of carbon disulfide (Canister results, Appendix A).

Based on the committee's review, the Fort Worth League of Neighborhoods concludes that a serious lack of information is available on gas facilities that can be independently verified at this time. It would seem prudent, therefore, to move forward cautiously. Too many new questions have now arisen about safety and health impacts, particularly regarding the cumulative effects of so many new sources of pollution.

All of the operators involved in this report, with the notable exception of Quicksilver Resources, declined to cooperate in providing the most basic of information needed for research on proposed pipelines.

Further, the League believes it is in the best financial interest of the FWISD to wait to sign more mineral leases until the price of gas is higher, thus affording the district more revenue.

Since the price for natural gas is very low at present, the harvesting of FWISD minerals would not be advantageous at this time. As of 9 February, 2011, gas prices were trading at $4.22/mcf, well below the historical average price of approximately $6/mcf.

Good stewardship of resources is a part of fiduciary duty and, as such, should take into account when prices are at low levels and substantially below averages. Once minerals are harvested, they are gone forever. Obviously, by waiting until prices return to more

normal historical levels minerals could be harvested at much higher prices which would greatly benefit the ISD.

In order to harvest minerals safely and responsibly, the League makes the following recommendations and strongly suggests the following requirements be incorporated into all future lease documentation and used as a basis for policy updates.

Recommendations for Drilling Near FWISD Schools

The following recommendations should be included in all Ft. Worth ISD leases going forward and incorporated into policy:

1.) Setbacks of approximately 1 mile from the school boundaries are needed to ensure that emissions of carbon disulfide (neurotoxin), carbonyl sulfide, benzene (carcinogen) and other drilling toxics do not exceed 8 hour limits for short term health benchmarks (See Dispersion Modeling Results below).

2.) The use of electric drill rigs, electric compressor engines and electric motors for driving any other stationary gas field infrastructure must be implemented on sites near schools.

3.) Condensate/produced water tanks should be independently monitored for control of VOC emissions.

4.) Vapor recovery units to be used when appropriate.

5.) No-bleed pneumatic valves and fittings should be used on pipeline networks near schools.

6.) Green completions should be used.

7.) Substitutions for toxic field materials (e.g. proppants, solvents, friction reducers, acid neutralizers, paints, etc.) near school properties must be used when non-polluting options are available.

8.) Testing and monitoring should be carried out for the life of the wells by an independent entity. The operators should not be allowed to provide testing results under any circumstances. All testing should be done without the operators prior knowledge.

Recommendations on Natural Gas Pipelines near FWISD Schools

The League reviewed pipeline locations near ISD owned properties. The League also asked the district to request basic information on existing and proposed pipelines servicing ISD properties from the energy companies. With the notable exception of Quicksilver Resources, the operators declined to provide this information. Copies of company responses are provided (See Appendix B).

It is important to note that PIR's (pipeline impact radii - the zone or area around the pipeline which will be impacted should an explosion occur) calculations cannot be done without this information. It is crucial to calculate and draw these zones to ensure that no school falls within a potential PIR.

The operators reluctance to provide this basic information raises serious questions of accountability to the community in reducing inherent risks. (See Appendix B for Company Responses)

The following are the League's recommendations regarding gas pipelines near ISD properties:

1) The FWISD should require in bid documents the location, diameter, and pressure information (both Maximum Allowable Operating Pressure and expected operating pressure) about existing or proposed pipelines needed to serve any school owned tracts;

2) The FWISD should require operators to provide maintenance and inspection information about pipelines under or near school owned tracts on a regular basis including both gathering lines as well as transmission lines;

3) The FWISD should require pipeline companies to provide adequate liability insurance ($100 million) for any pipelines on school property or whose Potential Impact Radius overlaps school property (see sample agreements in the appendix to this report).

4) The FWISD should review and acknowledge each Potential Impact Radius of existing and proposed pipelines as determined by the industry developed C-Fer Study, and refuse to sign any lease that does not contain assurance that none of the pipelines associated with the lease will cause any existing or proposed school building to fall within a Potential Impact Radius.

5) If pipelines are laid on school property, or in close proximity, the FWISD should prevent future school buildings or expansion of existing school buildings to fall within a pipeline's Potential Impact Radius, and review the recommendations of the national Pipelines and Informed Planning Alliance for other ways to ensure greater pipeline safety in the vicinity of existing and potential school buildings.

6) In conjunction with the City of Fort Worth, the FWISD should develop adequate maps locating all existing natural gas pipelines in relation to all FWISD school properties. The FWISD should review the locations of the existing pipelines in conjunction with a review all current site-based evacuation plans for FWISD properties. Where necessary, the FWISD should revise the emergency evacuation plans for schools to provide greater safety in a gas pipeline emergency.

What We Learned

* **Two sites covered in the ERG preliminary results for the City of Ft. Worth showed gross violation of TCEQ permits, of which neither the City nor State was aware.** This underscores the need for independent monitoring for the life of natural gas facilities.

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* **Both the City and the State have relied heavily on an "honor" system with the operators to date.** Operators, under state law, need nothing more than an authorization called a permit by rule to operate most oil and gas facilities. This is merely a statement from the operator that they will not emit above a certain threshold.

* **No regular physical verification through testing or regular inspection of each gas facility is conducted by TCEQ.** Further, permits filed by the operators with TCEQ contain the following statement: ***"The [gas] company will create and maintain all required records, including monitoring and testing results"***. There is, of course, an inherent conflict of interest in the operators' need to maximize profits. Permit violations can and do go unchecked.

* **The City of Ft. Worth gas inspector responds to spills or leaks but does not monitor emissions from sites.** All responsibility for emissions has been given to the TCEQ who in turn merely authorizes sites as discussed above. The City of Ft. Worth, within its jurisdiction, has the same authority under the Texas Health and Safety Code as the TCEQ to actively monitor emissions from natural gas facilities. To date, the city has declined to use this power. (See language from Texas Health and Safety Code , Appendix C)

* **Pollutants were detected at the majority of sites tested by ERG for the City.** Though none exceeded short term health benchmarks, several exceeded long term benchmarks. Further, this confirms that thousands of new "point sources" of pollution have been directly contributed by natural gas operations.

* **No data was available for future pipeline placement.** XTO, Chesapeake Energy and Finley Resources declined to divulge and/or ignored requests for placement, size and pressure of pipelines. Impact zones cannot be calculated without it and no school should fall within an impact zone. Quicksilver Resources was the only company willing to co-operate (See "Company Responses," Appendix B).

* **No master plan of all well facilities for the city is available.** The City does not map in a comprehensive manner all gas facilities within the city limits. In addition, the

"master plan" mentioned by a representative of Chesapeake Energy at the recent school board meeting is not filed with the city. It proved to be the "Meerkat Plan" which is in a single City Council district (9) and is "subject to change." A copy appears on the Chesapeake website with the description: "the comprehensive plan can allow the development of natural gas," yet no detailed information is given. It primarily covers the location of pad sites.

Introduction

In 2008, the Ft. Worth Independent School District (FWISD) sent recommendations to the city council which effected changes within the city's ordinance to add further protection to the children and teachers attending FWISD schools. Amongst other provisions, these included setbacks of 1200 feet, twice the distance allowed under the city's ordinance.

Unfortunately at that time, no information had come to light regarding toxic air emissions from drill sites.

As the City of Ft. Worth never carried out an environmental impact study prior to drilling within the city, there was no indication of the impacts a high impact well might have on its immediate neighborhood.

In 2008, the Mayor and City Council appointed a Task Force committee (including industry representatives) to study, review and provide recommendations for the revision of the City's Gas Drilling Ordinance. The committee's review period, which was to have included a review of regulations regarding the environmental impacts of drilling, was shortened by several months. No substantial review of the ordinance's environmental regulations was made; no comprehensive environmental recommendations were made. Consequently, primarily only superficial disturbances, such as noise and dust, were dealt with by the city in these ordinance revisions while all environmental questions were tabled.

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In 2008, Dr. Al Armendariz of Southern Methodist University conducted a study of ozone related compounds thought to be coming from gas drilling activities in North Texas. The study concluded that drilling activities were contributing more than all the cars, trucks and airplanes in the region to ozone.

In May 2009, private air tests were conducted which raised additional questions about emissions coming from gas wells within the city. This brought to light other toxic compounds apart from ozone contributors. The new compounds included benzene, a known carcinogen, together with toluene, ethylbenzene and m&p xylenes. In addition, various sulfur compounds, particularly carbon disulfide (known neurotoxin), were also detected at extremely high levels. Carbon disulfide was found at levels 300 times the norm for ambient urban air. This raised additional questions about the impacts of these wells on their immediate neighborhood.

Based on this testing, the Texas Commission for Environmental Quality (TCEQ) decided to begin in-depth testing in North Texas to determine the extent of these new compounds. These tests in turn confirmed that benzene, toluene and carbon disulfide in addition to many other chemicals were indeed being emitted by gas facilities in the region.

In TCEQ's final report on emissions in the Barnett Shale, issued in January, 2010, it was stated that "gas production facilities can, and in some cases do, emit contaminants in amounts that could be deemed unsafe."

According to TCEQ's Final Report, "twenty one facilities in 12 geographic locations [in North Texas] registered benzene above long term health based screening levels."

In addition to the findings of benzene, elevated levels of **carbon disulfide** (compound of concern in this report), ethane, 1,2 dibromethane and isopentane were also detected above short term health based comparisons.

In total, TCEQ stated that "35 chemicals were detected above appropriate short term comparisons."

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TCEQ continued testing in Ft. Worth again in April, 2010 and benzene was again detected. TCEQ Executive Director Mark Vickery stated that "results returned benzene concentrations [in Ft. Worth] that warrant further review."

At that time, the city of Ft. Worth decided to conduct its own air quality study and subsequently hired ERG. The preliminary results were issued on 14 February, 2011. The report states "benzene and carbon tetrachloride were identified as key VOCs at each site." **Two sites were found to be in violation of TCEQ's 25 ton per year limit for VOC's. One of the sites was found to be emitting up to 100 tons per year. Further, neither the City nor the State was aware that there was a problem with these sites.**

> Claims by industry of air emissions being regulated were found to be misleading. "Regulation" consists of nothing more than a permit filed with the TCEQ stating that emissions will not go above a certain threshold. But no independent routine physical verification of these permit claims is currently being done by the State or the City. It is essentially an "honor" system.

Perhaps most disturbing, is the additional fact that pollutants were found at the majority of sites tested by ERG, albeit at relatively low levels, raising serious concerns about the cumulative impact of so many new sources of pollution within the city.

In October 2010, bids were brought before the Trustees of the FWISD which requested that drilling be allowed to occur less than 1200 from several schools. Since this was in violation of school board policy, a waiver was required.

The League suggested that a committee be formed consisting of scientific and health professionals who could examine existing data and make recommendations to the

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FWISD regarding additional measures to be incorporated into FWISD leases for more protections for the children.

Dr. Melanie Sattler

Dr. Ramon Alvarez

Mr. Carl Weimer

Dr. David Sterling

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Team members included:

· Dr. Melanie Sattler, Engineer and Associate Professor, Environmental Engineering, University of Texas at Arlington;

· Dr. Ramon Alvarez, Atmospheric Scientist and Member of Ft. Worth Air Quality Study Committee, Environmental Defense Fund, Austin;

· Dr. David Sterling, Chair of Environmental and Occupational Health, University of North Texas Health Science Center, Fort Worth;

· Carl Weimer, Executive Director, Pipeline Safety Trust and member of the U.S. Department of Transportation's Technical Hazardous Liquid Pipelines Safety Standards Committee and the steering committee of the Pipelines and Informed Planning Alliance, Bellingham, Washington.

These professionals agreed to assess the information available and make recommendations to the FWISD which could be incorporated into future leases.

Lack of Independent Information

> TCEQ's Final Report in 2010 on Emissions in Barnett Shale stated "gas production facilities can, and in some cases do, emit contaminants in amounts that could be deemed unsafe."

TCEQ allows operators to file for authorizations called permit by rule's (PBR's) at their discretion. Given that this requires nothing more than record keeping at present, the PBR thus becomes an "honor" system. This is problematic for a variety of reasons not least of which is that the operators have a clear conflict of interest inherent in their need to maximize profits.

But from the public's perspective, this means that gas facilities in the city are not regularly physically inspected by TCEQ. Statements from the operators that VOC's and other toxics will not exceed thresholds is all that is currently required by the State for the majority of permits.

Given the VOC levels detected by ERG within Ft. Worth, it is reasonable to question whether more facilities than merely the two sites confirmed might not be emitting toxics at levels deemed to be unsafe.

The need for independent testing and more public accountability is highlighted by a recent letter sent to Governor Perry. On 7 February, 2011, 30 lawmakers from all over North Texas sent asked the Governor for an Emergency Proclamation for Air Monitors. They requested that funds be made available immediately for an additional 20 monitors in the region. The letter states that this is to "provide an opportunity for "good science" and unbiased statistics, revealing an accurate picture of our air quality." Such a request is an extraordinary measure.

While very few sites are physically inspected by TCEQ, in addition, there is no concurrent monitoring or oversight being carried out by the City of Ft. Worth.

Rick Trice of the city of Ft. Worth states that if the city's gas inspectors "determine that a spill has occurred or that a leak is evident they get engaged with the operator to remediate. We also contact TCEQ."

There is, however, no routine physical oversight of emissions by the City's gas inspectors.

Under the Texas Health and Safety Code, the city has the same authority within its jurisdiction as granted to TCEQ. The Ft. Worth City Council is aware of this but has chosen not to exercise this authority thereby fully relinquishing its oversight capabilities and responsibilities to the TCEQ (See Appendix E for Health and Safety Code references).

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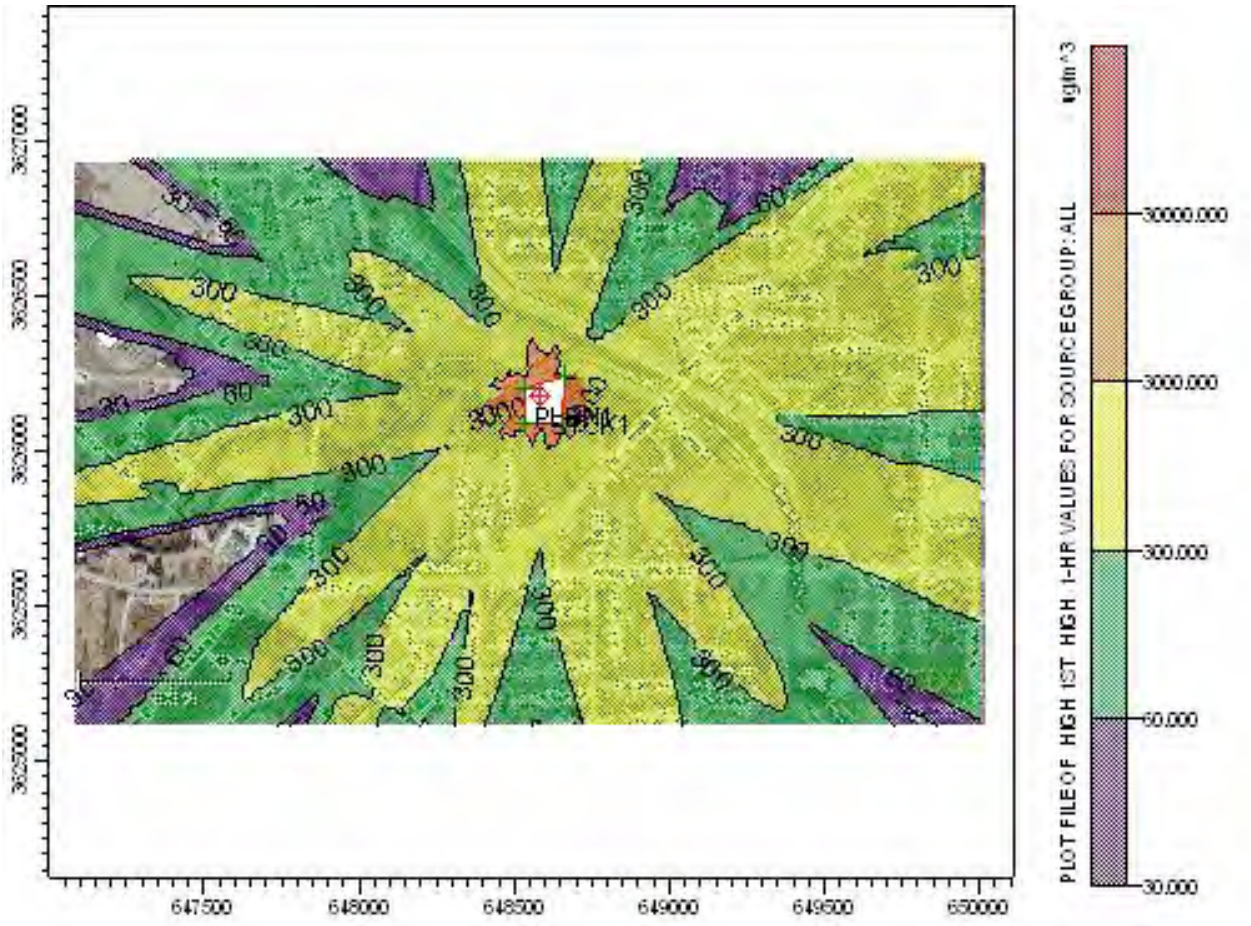
In short, testing, monitoring and planning has been entrusted to the operators by both the City and the State. A mere statement of compliance generally suffices. Unfortunately, these operators have a clear conflict of interest due to the inherent need to maximize profits which brings into question the validity of such statements.

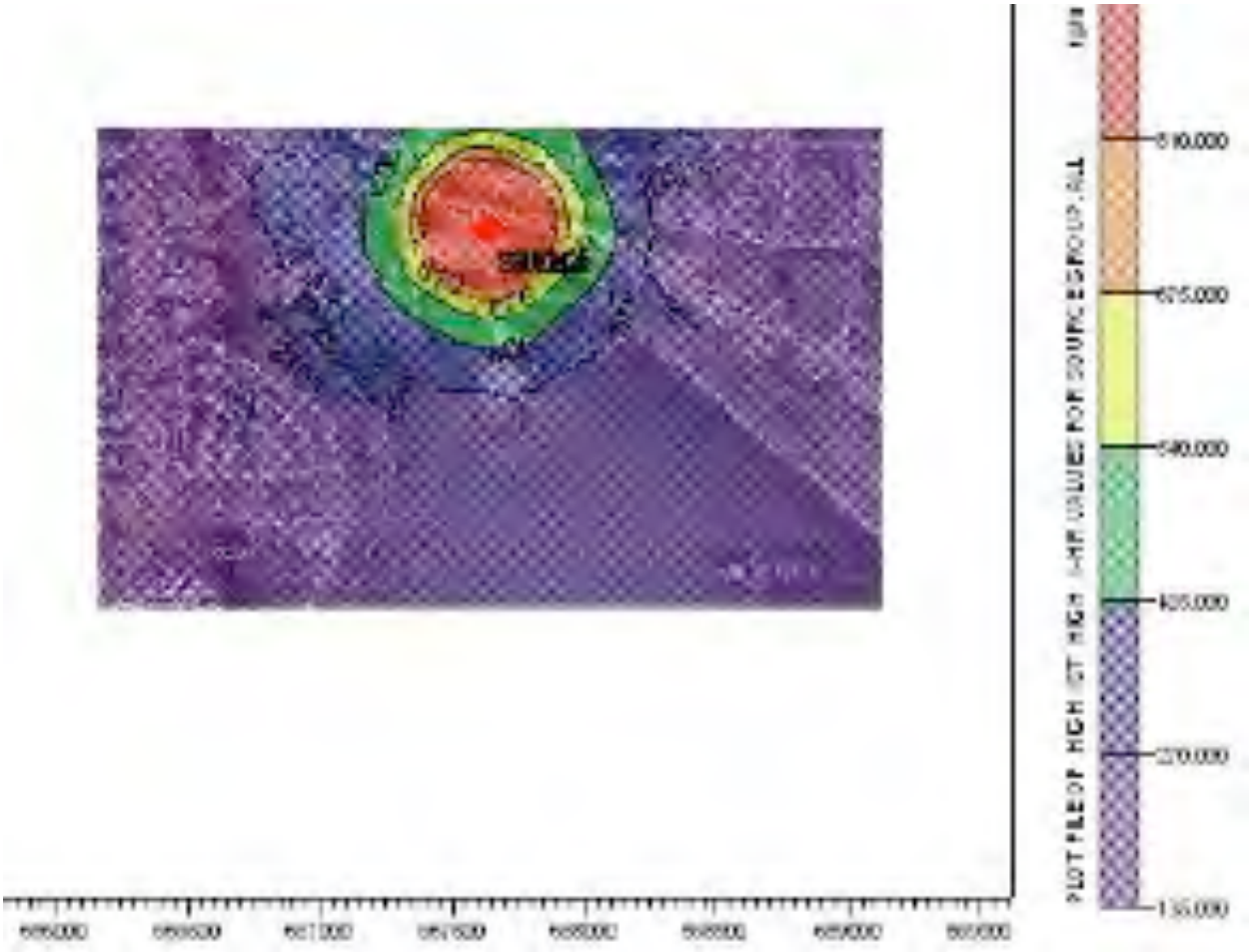
In addition, it was readily admitted by city and ISD staff that they do not routinely request information such as pipeline placement, size and pressure or API (American Petroleum Institute) numbers which enable one to access production history and pipeline information from the Texas Railroad Commission.

This did not seem to be a deliberate abrogation of responsibility as much as simply ignorance of what can be done to protect the public safety and ensure that facilities are monitored even superficially.

Dispersion Modeling Results



Plot 1 - Drill site near Burton Hill Elementary - carbon disulfide plot. Plume extends 1 mile from the source in this graphic. Full extent of plume was in excess of 2 miles. Plot 1 multiples were up to 1000 times the short term health benchmark for carbon disulfide.



Plot 2 - Site near E. Handley Elementary, W. Handley Elementary, Maudrie M. Walton lementary and Dunbar High School of carbonyl sulfide, a byproduct of carbon disulfide. Plume extends in excess of 1 mile. Plot 2 multiples were 6 times the health benchmark for carbonyl sulfide.

On both models, wherever a color is present, the short term health benchmarks were exceeded. Each color variation indicates a <u>multiple</u> that these benchmarks were exceeded. In Plot 2, because the color fills the entire graphic, one can see that the whole area has been exposed and the plume moves out beyond the edge of the graphic.

Dispersion modeling is an effective tool to determine the extent and path of pollutants as they move from their source. Engineering calculations and meteorological data are fed into a computer "model" which then predicts the plume's path as it travels throughout the city from its source.

To our knowledge, this is some of the first dispersion modeling done on pollutants from natural gas drilling in the Barnett Shale region.

Due to the fact that operators have not disclosed emission rates and ready access to actual emissions can only be done by testing at the source on each individual pad site or facility, this information is not readily available for most wells in the Barnett Shale. As with the ERG study, estimated emission rates were calculated from the test data, assuming the measured emissions on the day of testing are representative of the emissions that occur over the year or during a certain phase of operations, i.e. drilling. These rates could be revised at a later date as more data become available.

In order to conduct dispersion modeling, the rates are calculated based on the amounts of pollutants found in the actual canister data. Engineers estimate what the emission rate most likely was in order to get that amount of pollutant in the canister over a certain time period.

Discrepancies can occur if, for instance, errors are inherent in model formulation or other sources of the pollutant are nearby. This could cause the emission rate to be over-

TCEQ allows the operators to test and monitor their own facilities and provide the results to the State. There is an inherent conflict of interest in this due to the operators' need to maximize profits. No independent testing to verify these results routinely occurs.

estimated. In this case, the possibility that other sources of carbon disulfide were nearby is highly unlikely. It is known that this compound does not come from cars, trucks or planes according to the U.S. Environmental Protection Agency. **Further, the only indus-**

trial activity other than natural gas operations which could produce levels this high is the production of viscose rayon. There are no viscose rayon plants in North Texas.

AERMOD, the recommended model of the U.S. Environmental Protection Agency was used for the dispersion modeling together with extensive meteorological data.

> Statements from the operators that VOC's and other toxics will not exceed thresholds is all that is currently required by the State for the issuance of the majority of permits.

Carbon disulfide (carbonyl sulfide is a byproduct of carbon disulfide) proved the compound of most concern.

It was determined through the models that setbacks of more than one mile would be needed to keep the exceedances of short term levels below the appropriate health benchmarks.

Data was taken from summa canister tests to ascertain the impacts of pollutants on the immediate environment. Canister data came from a variety of sources including private testing, TCEQ and industry's own TITAN Engineering Study.

In the summer of 2010, the Barnett Shale Energy Education Council (BSEEC), with funding from the industry, commissioned TITAN Engineering to conduct testing at gas facilities in Ft. Worth and Arlington.

Dr. Ed Ireland, Executive Director of the BSEEC stated that "...we recognized the community's need for more information about natural gas drilling and air quality that is transparent, independent and scientifically sound."

In a League public meeting held in August, 2010, Mr. Doug Canter of TITAN confirmed that the operators were given as much as 3-4 weeks notice before testing began in the TITAN study. They were also told the exact dates they would be tested. Certain anoma-

lies can be seen in the results. For instance, at one site which had produced condensate for thirty days prior to the testing date, it can be seen that condensate production was apparently shut down for the day of testing. This could greatly skew the ambient data.

In their announcement of the results, however, the BSEEC proclaimed "that TITAN concludes that harmful levels of benzene and other compounds are not being emitted from natural gas sites in the study area."

Ambient air data on its own, however, does not give a full picture of what is occurring.

Therefore, it was decided that some dispersion modeling should be carried out for this report on TITAN's data. The modeling results can be seen in Plot 2 above. The plume of carbonyl sulfide (a byproduct of carbon disulfide) extended out over a mile from the source thereby potentially affecting **East Handley Elementary (.85 mile), West Handley Elementary (1.1 mile), Maudrie M. Walton Elementary (1.1 mile) and Dunbar High (1.25 miles)** . Levels were as high as 6 times the short term health benchmark. And this is seen although operators had 3-4 weeks to prepare for testing.

Benzene has been the compound discussed most to date with regard to air emissions in the Barnett Shale region. But carbon disulfide must now be added to that discussion.

Carbon disulfide has a cumulative effect in the body. It builds up in the system over time and repeat exposure. It is known to cause neurological, cardiovascular, behavioral and psychotic abnormalities.

Carbon disulfide was modeled from data taken during the drilling phase of operations at a Chesapeake Energy site near **Burton Hill Elementary (.49 miles) and Castleberry ISD schools** and carbonyl sulfide at the Quicksilver Resources Lake Arlington Compressor Station, near **East Handley Elementary (.85 miles), W. Handley Elementary (1.1 mile), Maudrie M. Walton Elementary (1.1 mile) and Dunbar High (1.25 miles)**.

Both models suggested that a setback of at least one mile was needed for each compound.

In the above graphics, the carbon disulfide plume can be seen dispersing over a mile from the source in Plot 1 near **Burton Hill Elementary** at levels **exceeding short term health benchmarks up to 1000 times**. The full extent of the plume in Plot 1, (the plume not shown in its entirety in either graphic), was in excess of 2 miles from the source. It is important to note that unlike in the TITAN study, the operator was unaware that testing was being conducted on their operations. This could account for the very high levels seen and is a good argument for random testing without the operators knowledge.

In the model of Plot 1, a level of 241 mg/m3 is predicted as a 1-hour maximum concentration exposure.

To put this into perspective, since carbon disulfide exposure would typically be in a factory, both OSHA (Occupational Safety and Health Administration) and NIOSH (National Institute for Occupational Health and Safety) give recommended limits. **The measured levels of carbon disulfide in this report are significantly above the *adult worker* short term exposure regulatory and recommended limits. (See Appendix F)**

This is important to note because this applies to adults and is not specific to children since most exposure to carbon disulfide occurs in a factory setting where children would not normally be. When industrial activities such as gas drilling enter neighborhoods, however, this is no longer the case.

We know that benzene is 6 times more likely to cause cancer in children than adults. This was ascertained in a study conducted by the University of Texas School of Public Health in 2008. It is reasonable to assume that carbon disulfide will also affect children more greatly than adults due to their growing bodies and metabolisms.

The American Industrial Hygiene Association's Emergency Response Planning Guidelines (ERPG) 1 is the maximum airborne concentration **below** which it is believed nearly all individuals could be exposed up to one hour to carbon disulfide without experiencing other than mild transient adverse health effects or perceiving a clearly defined objectionable odor. This value for carbon disulfide is 3 mg/m3.

In this report, carbon disulfide levels seen in the Plot 1 model were at a level which was 10 times higher than this benchmark.

ERPG 2 is the maximum airborne concentration **below** which it is believed nearly all individuals could be exposed up to one hour to carbon disulfide without experiencing or developing *irreversible or other serious health effects* that could impair their abilities to take protective action. The value for this is 155 mg/m3.

The model near Burton Hill Elementary predicts a level of 241 mg/m3 which is almost two times as high as ERPG 2.

It is important to note that ERPG 2 refers to a threshold at which *irreversible and serious effects can occur*. The levels predicted in the model are almost twice this high.

Further, there is little known about ***cumulative*** exposure of carbon disulfide in children.

According to government sources (US Environmental Protection Agency and Australian Government Department of the Environment):

Industry sources of carbon disulfide include natural gas production and distribution. It occurs naturally in geothermal sources.

Acute effects: At very high levels, carbon disulfide may be life-threatening because of its effects on the nervous system or heart. Exposure can be through inhalation, absorption through the skin, ingestion, or skin or eye contact. In acute poisoning, early excitation of the central nervous system resembling alcoholic intoxication occurs, followed by depression, stupor, restlessness, unconsciousness, and possible death.

Chronic effects: In chronic poisoning, there are sensory changes such as a crawling sensation in the skin, sensations of heaviness and coldness, and "veiling" of objects so that they appear indistinct. Exposure can cause changes in breathing, chest pains, muscle pain, weakness, loss of feeling in the hands or feet, eye problems, skin blisters, chronic fatigue, loss of memory, personality changes, irritability, dizziness, anorexia, weight loss, psychosis, polyneuropathy, gastritis, kidney and liver damage, dermatitis, mental deterioration, Parkinsonian paralysis, and insanity".

Carbon disulfide does not come from cars, trucks, airplanes or any other mobile source according to the U.S. Environmental Protection Agency.

Carbon disulfide is known to cause reproductive disorders and may damage the developing foetus. It may decrease fertility in men and women, causing sperm abnormalities and spontaneous abortions. (See Appendix D for more information on the health effects of carbon disulfide exposure).

Canister data was taken from a variety of sources including private testing, TCEQ and industry's own TITAN Engineering study.

Other compounds such as benzene, toluene, ethylbenzene, xylenes, trimethylbenzene and formaldehyde were also detected in these tests (See Appendix A). Some were modeled and it was found that the setbacks for protection form carbon disulfide would adequately offer protections to these other compounds as well. This may change as more data is modeled.

Benzene was detected in subsequent tests of the site near Burton Hill Elementary at the very high level of 62.4 ppb. This, however, has yet to be modeled.

In a public meeting in November, 2009, Dr. Michael Honeycutt, Chief Toxicologist for TCEQ, stated that "if we take care of the benzene, we will take care of the carbon disulfide too." **This study, however, found that carbon disulfide was traveling farther from the source than benzene and at very high levels.**

As far back as November, 2009, the TCEQ summoned the top operators in the Barnett Shale and requested that they address these emissions. **It is clear, however, from subsequent testing conducted by TCEQ and others that this has not occurred to date.**

Benzene and other compounds are still being detected in the City and the region near natural gas facilities.

While science is good at parsing out a single toxic and studying its effects upon a human or the environment, it is much more problematic to determine the cumulative effects of all these compounds breathed in together. Taking an in depth look at carbon disulfide exclusively, for instance, does not give an indication of what may be occurring in addition to carbon disulfide's effects on the body when one is also exposed to benzene, toluene, ethylbenzene, etc. This unfortunately becomes a toxic soup and complicates the picture dramatically.

The same must be said for considering benzene's effects out of context with all the other compounds detected in emissions from wells. They occur simultaneously; thus they all expose simultaneously.

Pipeline Safety Near FWISD Properties

For several years, the Fort Worth Independent School District Board of Trustees has considered and voted on bids to lease minerals under district owned properties, including many of the district's school campuses. Growing concerns about the impact of gas drilling emissions on human health as well as growing awareness of the rising number of natural gas pipelines in close proximity to institutional properties has raised questions about the placement of natural gas infrastructure near neighborhoods, schools, medical facilities and facilities which serve the elderly.

Knowing that the time to place safety measures regarding drilling equipment and pipelines is in mineral rights leases **before** they are signed, some have begun to look more and more at those opportunities to promote greater environmental protections in the drilling procedures, particularly where drilling is in close proximity to children.

In the fall of 2010, the Fort Worth Independent School District considered more leases for more than 40 of their properties.

Fort Worth League of Neighborhoods Report to ISD

The League reviewed energy company bids on the proposed leases as well as a map of well locations and pipeline locations near ISD owned properties. The League also asked the district to request basic information on existing and proposed pipelines servicing ISD properties from the energy companies. Copies of company responses are provided (See Appendix B).

The following are recommendations regarding gas pipelines near ISD properties:

1) The FWISD should require in bid documents the location, diameter, and pressure information about existing or proposed pipelines needed to serve any school owned tracts;

2) The FWISD should require operators to provide maintenance and inspection information about pipelines under or near school owned tracts on a regular basis including maintenance on gathering lines as well as transmission lines;

3) The FWISD should require pipeline companies to provide adequate liability insur-

> Carbon disulfide has a cumulative effect in the body. It builds up over time and repeat exposure.

ance ($100,000,000) for any pipelines on school property or whose Potential Impact Radius overlaps school property. Sample agreements such as the Bellingham and Bellevue Agreements should be consulted.

4) The FWISD should review each Potential Impact Radius of existing and proposed pipelines as determined by the industry developed C-Fer Study and acknowledge that they are aware of that impact radius before leases are signed.

5) If leases are signed and pipelines laid on school property, or in close proximity, the FWISD should review the recommendations of the national Pipelines and Informed Planning Alliance before any new buildings or expansions of existing buildings are approved on that impacted property.

6) In conjunction with the City of Fort Worth, the FWISD should develop adequate maps locating all existing natural gas pipelines in relation to all FWISD school properties. The FWISD should review the locations of the existing pipelines in conjunction with a review all current site-based evacuation plans for FWISD properties. Where necessary, the FWISD should revise the emergency evacuation plans for schools to provide greater safety in a gas pipeline emergency.

It must be noted that it proved impossible to complete the work on future pipeline placement and calculations of Potential Impact Radii for this report due to the operators lack of co-operation.

If these activities are as benign as we have been led to believe then there should have been a willingness on their part to prove to us that they are taking precautionary measures and that no school falls within an area that could be impacted. This was decidedly not the case. All requests, with the notable exception of Quicksilver Resources, were either ignored or met with refusal. (See Appendix B for "Company Responses".)

It is crucial that Potential Impact Radii be calculated and that no school falls within such a zone. The precedent set in 1937, in New London, Texas, when a natural gas leak caused an explosion near the high school is still remembered. Two hundred and ninety four (294) children were killed and the school demolished.

The following link is for the Pipelines and Informed Planning Alliance study mentioned above:

http://www.pstrust.org/library/docs/PIPA-Report-Final-20101117.pdf

Conclusions

In its genesis, this project was envisioned to be a comprehensive review of available data with concomitant recommendations. Once into the project, however, it became patently clear that there is an appalling lack of information available on which to base

sound responsible decisions. In fact, this may be the most important point to be uncovered.

It was deeply disturbing how little information is available to elected officials or State regulating entities that is independent of the operators. Proper due diligence is nearly impossible. This was both startling and alarming.

Further, there appears to be a complete relegation of responsibility by both the City and State which allows industry to conduct operations at their own discretion with very little oversight or verification by governmental entities or accountability to the public.

Presumably because the operators are used to enjoying a lack of oversight or accountability, road blocks were met constantly in attempting to gather the most basic of information. The operators, in this case XTO Energy, Chesapeake Energy and Finley Resources, were uncooperative at best. Quick Silver Resources was the only operator contacted who offered help. Simple requests, made by FWISD staff, for API numbers on

> The Potential Impact Radius is the "zone" around a pipeline which would suffer impacts if an explosion occurred. The operators declined to provide the basic information necessary to calculate this zone thereby raising serious questions about accountability to this community.

individual wells to enable verification of information filed with the Texas Railroad Commission was simply ignored or refused (See Appendix B for Company responses). Requests for pipeline information was also ignored and declined.

Ms. Tarah Angelidis of XTO Energy wrote "If...XTO bids on the tracts [again], XTO will consider providing information at that time."

Maps proved a particular challenge.

The “master plan” mentioned at the 2010 School Board meeting by a representative of Chesapeake Energy is not on file with the city. It proved to be the "Meerkat Plan", which is in a single City Council district (9) and is "subject to change". A copy appears on the Chesapeake website with the description: “The comprehensive plan can allow the development of natural gas.” No detailed information is given apart from the location of pad sites.

In short, the city has no comprehensive plan or map of drilling or pipeline placement for the entire city; has not conducted independent on-going monitoring for emissions; and has no will to assume authority for such.

In addition, the TCEQ has no mechanism in place for routine physical verification of emissions at existing wells or processing facilities; allows operators to apply for an authorization for a site without routine physical examination of the facility; allows operators to conduct testing and monitoring of their own facilities.

Based upon the work done by this committee, the League strongly urges the FWISD to implement the safety measures found in this report. It is clear that the City’s ordinance is not nearly protective enough. These recommendations would ensure the school children and staff will have protection.

It will be quite some time before we have adequate access to enough independent data. To harvest minerals now, safety precautions must be implemented to ensure responsible drilling and production occurs.

Given the lack of active regulation and independent verification which we now know exists together with the knowledge that thousands of new sources of pollutants are being generated by these facilities of which the City and State were unaware, it would be highly imprudent to fail to implement safety standards such as are recommended in this report. Although it seems obvious to state, we must go above and beyond in the protections of the children of this community.

Fort Worth League of Neighborhoods Report to ISD

In conclusion, paramount importance needs to be placed upon:

* More transparency by all parties

* Co-operation by the operators;

* Less abrogation of responsibility by the City and State, more hands-on verification of permit documentation

* Greater access to in-house industry data and information;

* Comprehensive and thoughtful planning by the City and School district;

* Greater scrutiny of actual sites and less reliance on the "honor" system given the inherent conflicts of interest; and

* Accountability to the public

Appendix A

Canister data for Plot 1 follow.

Canister data for Plot 2 taken from Barnett Shale Energy Education Council's TITAN Engineering Study: Quicksilver Resources Lake Arlington site. They can be accessed in their entirety at: www.bseec.org

GD Air Testing Inc. www. gdair.com

CLIENT: **Deborah Rogers**
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Ft. Worth, TX 76114
(817)-821-0975

Project No.: **300 McNaughton Ln.**

GD Air Testing Lab. ID: **GD10-0087-001**
Report Date: 18-May-10
Date Analyzed: 13-May-10
Analyzed by: LAJ
GD Air QC Batch: **QC-051310TO14**
Method: EPATO14
NELAP Certification #: ***T104704364-09-TX***

REPORT OF ANALYTICAL RESULTS Page 1 of 2

SAMPLE DESCRIPTION	MATRIX	SAMPLE BY		SAMPLED DATE /RECEIVED		
300 McNaughton Ln.	Air	**Deborah Rogers**		**05/05/10**	**05/06/10**	
CONSTITUENT	MW	CAS	PQL* ppbv	**RESULT** ppbv	ug/cu M	NOTE
Benzene	78	71432	0.26	**1.24**	3.96	
Benzylchloride	126.6	100447	0.26	ND	ND	**N**
Bromomethane (Methyl Bromide)	94.9	74839	0.26	ND	ND	
Carbon tetrachloride	153.8	56235	0.26	ND	ND	
Chlorobenzene	112.6	108907	0.26	ND	ND	
Chloroethane (Ethyl Chloride)	64.5	75003	0.26	ND	ND	
Chloroform	119	67663	0.26	ND	ND	
Chloromethane (Methyl Chloride)	50.4	74873	0.26	**0.50**	1.04	
1,2-Dibromoethane (EDB)	187.9	106934	0.26	ND	ND	
1,2-Dichlorobenzene	147	95501	0.26	ND	ND	
1,3-Dichlorobenzene	147	541731	0.26	ND	ND	
1,4-Dichlorobenzene	147	106467	0.26	ND	ND	
1,1-Dichloroethane	99	74343	0.26	ND	ND	
1,1-Dichlorethene	97	75354	0.26	ND	ND	
Dichlorodifluoromethane (F12)	120.9	75718	0.26	**0.42**	2.06	
Dichlorotetrafluoroethane (F114)	170.9	76142	0.26	ND	ND	
1,2-Dichloroethane (EDC)	99	107062	0.26	ND	ND	
cis-1,2-Dichloroethene	97	156592	0.26	ND	ND	
trans-1,2-Dichloroethene	97	156605	0.26	ND	ND	**N**
Dichloromethane (Methylene chloride)	84.9	75092	0.26	ND	ND	
1,2-Dichloropropane	113	78875	0.26	ND	ND	
cis-1,3-Dichloropropene	111	10061015	0.26	ND	ND	
trans-1,3-Dichloropropene	111	10061026	0.26	ND	ND	
Ethylbenzene	106	100414	0.26	**0.47**	2.05	
Hexachlorobutadiene	260.8	87683	0.64	ND	ND	
Styrene	104	100425	0.26	ND	ND	
1,1,2,2-Tetrachloroethane	167.9	79345	0.26	ND	ND	
Tetrachloroethene (PCE)	165.8	127184	0.26	ND	ND	
Toluene	92	108883	0.26	**3.20**	12.0	
1,1,1-Trichloroethane (TCA)	133.4	71556	0.26	ND	ND	
1,1,2-Trichloroethane	133.4	79005	0.26	ND	ND	
1,3,5-Trimethylbenzene/4-Ethyltoluene	120.2	108678	0.26	**1.26**	6.19	
1,2,4-Trimethylbenzene	120.2	95636	0.26	**0.56**	2.73	
1,2,4-Trichlorobenzene	181.5	120821	0.64	ND	ND	
Trichloroethene (TCE)	131.3	79016	0.26	ND	ND	

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(817)-821-0975

Project No.: **300 McNaughton Ln.**

GD Air Testing Lab. ID: **GD10-0087-001**
Report Date: 18-May-10
Date Analyzed: 13-May-10
Analyzed by: LAJ
GD Air QC Batch: **QC-051310TO14**
Method: EPATO14
NELAP Certification #: ***T104704364-09-TX***

REPORT OF ANALYTICAL RESULTS Page 2 of 2

SAMPLE DESCRIPTION	MATRIX	SAMPLE BY		SAMPLED DATE /RECEIVED		
300 McNaughton Ln.	Air	**Deborah Rogers**		**05/05/10**	**05/06/10**	
CONSTITUENT	MW	CAS	PQL* ppbv	**RESULT** ppbv	ug/cu M	NOTE
Trichlorofluoromethane (F-11)	137.4	75694	0.26	ND	ND	
Trichloritrifluoroethane (F-113)	187.4	76131	0.26	ND	ND	
Vinyl Chloride	62.5	75014	0.26	ND	ND	
m&p-Xylenes	106	1330207	0.26	**2.62**	11.4	
o-Xylene	106	95476	0.26	**0.93**	4.01	
TPH as DRO	142		0.60	**40.0**	232	**S**
Surrogate Recovery Report			Spiked ppbv	Found ppbv	R%	
1,4-Difluorobenzene (SS1)	118.1	540363	5.00	4.33	87	
Bromofluorobenzene (SS2)	175	460004	5.00	2.22	44	
*Comparison with the method blank this sample run with a dilution factor of:				**1.28**		

Canister #145 was received at an initial pressure of -0.35psi and pressurized to 3.7psi.
N: Not in the Scope of NELAC Accrediation. Instrument calibration not performed for this analyte.
Analyte determined as tentatively identified compound (TIC).
S: Not in Scope of NELAC Accrediation.
*RESULTS Listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit).
* The control limit for Surrogate Recovery % of all spiked compound is 70% - 130%. Only one is required to pass.
*Concentrations in ug/cu M reported at 760 mm Hg pressure and 298 deg.K.
*QA/QC reports followed this report include: Method blank, Blank spike (BS) and Blank spike duplicate (BSD)

Respectfully submitted
GD Air Testing, Inc.
AJ for Dr. Dai
George Dai, Ph.D.
Laboratory Director
Data File: varian\data\100513-8-0087-1.sms
Report File: GDAIR D:\Client-Report\GD10-0087-001

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Project No.: **300 McNaughton Ln.**

GD Air Testing Lab. ID: **GD10-0087-001M**
Report Date: 18-May-10
Date Analyzed: 13-May-10
Analyzed by: LAJ
GD Air QC Batch: **QC-051310TO14**
Method: GC/MS SCAN
NELAP Certification # ***T104704364-09-TX***

REPORT OF ANALYTICAL RESULTS Page 1 of 1

SAMPLE DESCRIPTION	MATRIX	SAMPLE BY		SAMPLED DATE /RECEIVED		
300 McNaughton Ln.	Air	**Deborah Rogers**		**05/05/10**	**05/06/10**	
CONSTITUENT	MW	CAS	PQL* ppbv	**RESULT** ppbv	ug/cu M	NOTE
Sulfur Gases by GC/MS						
Carbon Disulfide	76	75150	1.28	**10.8**	33.6	**N**
Carbonyl Sulfide	60	463581	1.28	ND	ND	**N**
Dimethyl Sulfide	62	75183	1.28	ND	ND	**N**
Dimethyl Disulfide	94	624920	1.28	ND	ND	**N**
Methyl ethyl Disulfide	108	20333395	1.28	ND	ND	**N**
Methyl propyl Disulfide	122	2179604	1.28	ND	ND	**N**
Butyl Mercaptan	90	109795	1.28	ND	ND	**N**
Isobutyl Mercaptan	90	513531	1.28	ND	ND	**N**
Ethyl Mercaptan	62	75081	1.28	ND	ND	**N**
Methyl Mercaptan	48	74931	1.28	ND	ND	**N**
Propyl Mercaptan	76	107039	1.28	ND	ND	**N**
Isopropyl Mercaptan	76	75332	1.28	ND	ND	**N**
tert-Butyl Mercaptan	90	75661	1.28	ND	ND	**N**
Diethyl Sulfide	90	352932	1.28	ND	ND	**N**
Diethyl Disulfide	122	110816	1.28	ND	ND	**N**
Dimethyl Trisulfide	126	3658808	1.28	ND	ND	**N**

*Comparison with the method blank this sample run with a dilution factor of: **1.28**
Canister #145 was received at an initial pressure of -0.35psi and pressurized to 3.7psi.
N: Not in the Scope of NELAC Accrediation. Instrument calibration not performed for this analyte.
Analyte determined as tentatively identified compound (TIC).
*RESULTS Listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit).
*QA/QC reports followed this report include: Method blank, Blank spike (BS) and Blank spike duplicate (BSD)

Respectfully submitted
GD Air Testing, Inc.

AJ for Dr. Dai

George Dai, Ph.D.
Laboratory Director
Data File: varian\data100513-8-0087-1.sms
Report File: GDAIR D:\Client_Report\GD10-0087-1M

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CLIENT: **GD Air Testing, Inc.**

Project No.:

GD Air Testing Lab. ID: **Method Blank**
Report Date: 05/14/10
Date Analyzed: 05/13/10
Analyzed by: LAJ
GD Air QC Batch: QC-051310
Method: EPATO14
NELAP Certification #: ***T104704364***

REPORT OF METHOD BLANK RESULTS

Page 1 of 2

SAMPLE DESCRIPTION	MATRIX	SAMPLE BY	SAMPLED DATE /RECEIVED			
BLK	Air					
CONSTITUENT	MW	CAS	PQL* ppbv	**RESULT** ppbv	ug/cu M	NOTE
Benzene	78	71432	0.20	**ND**	ND	
Benzylchloride	126.6	100447	0.20	**ND**	ND	**N**
Bromomethane (Methyl Bromide)	94.9	74839	0.20	**ND**	ND	
Carbon tetrachloride	153.8	56235	0.20	**ND**	ND	
Chlorobenzene	112.6	108907	0.20	**ND**	ND	
Chloroethane (Ethyl Chloride)	64.5	75003	0.20	**ND**	ND	
Chloroform	119	67663	0.20	**ND**	ND	
Chloromethane (Methyl Chloride)	50.4	74873	0.20	**ND**	ND	
1,2-Dibromoethane (EDB)	187.9	106934	0.20	**ND**	ND	
1,2-Dichlorobenzene	147	95501	0.20	**ND**	ND	
1,3-Dichlorobenzene	147	541731	0.20	**ND**	ND	
1,4-Dichlorobenzene	147	106467	0.20	**ND**	ND	
1,1-Dichloroethane	99	74343	0.20	**ND**	ND	
1,1-Dichlorethene	97	75354	0.20	**ND**	ND	
Dichlorodifluoromethane (F12)	120.9	75718	0.20	**ND**	ND	
Dichlorotetrafluoroethane (F114)	170.9	76142	0.20	**ND**	ND	
1,2-Dichloroethane (EDC)	99	107062	0.20	**ND**	ND	
cis-1,2-Dichloroethene	97	156592	0.20	**ND**	ND	
trans-1,2-Dichloroethene	97	156605	0.20	**ND**	ND	**N**
Dichloromethane (Methylene chloride)	84.9	75092	0.20	**ND**	ND	
1,2-Dichloropropane	113	78875	0.20	**ND**	ND	
cis-1,3-Dichloropropene	111	10061015	0.20	**ND**	ND	
trans-1,3-Dichloropropene	111	10061026	0.20	**ND**	ND	
Ethylbenzene	106	100414	0.20	**ND**	ND	
Hexachlorobutadiene	260.8	87683	0.20	**ND**	ND	
Styrene	104	100425	0.20	**ND**	ND	
1,1,2,2-Tetrachloroethane	167.9	79345	0.20	**ND**	ND	
Tetrachloroethene (PCE)	165.8	127184	0.20	**ND**	ND	
Toluene	92	108883	0.20	**ND**	ND	
1,1,1-Trichloroethane (TCA)	133.4	71556	0.20	**ND**	ND	
1,1,2-Trichloroethane	133.4	79005	0.20	**ND**	ND	
1,3,5-Trimethylbenzene/4-Ethyltoluene	120.2	108678	0.20	**ND**	ND	
1,2,4-Trimethylbenzene	120.2	95636	0.20	**ND**	ND	
1,2,4-Trichlorobenzene	181.5	120821	0.30	**ND**	ND	
Trichloroethene (TCE)	131.3	79016	0.20	**ND**	ND	

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CLIENT: GD Air Testing, Inc.

Project No.: **QC**

GD Air Testing Lab. ID:	**Method Blank**
Report Date:	05/14/10
Date Analyzed:	05/13/10
Analyzed by:	LAJ
GD Air QC Batch:	QC-051310
Method:	EPATO14
NELAP Certification #:	***T104704364***

REPORT OF ANALYTICAL RESULTS Page 2 of 2

SAMPLE DESCRIPTION	MATRIX	SAMPLE BY	SAMPLED DATE /RECEIVED		
BLK	Air				
CONSTITUENT	MW	CAS	PQL* ppbv	**RESULT** ppbv	NOTE ug/cu M
Trichlorofluoromethane (F-11)	137.4	75694	0.20	**ND**	ND
Trichloritrifluoroethane (F-113)	187.4	76131	0.20	**ND**	ND
Vinyl Chloride	62.5	75014	0.20	**ND**	ND
m&p-Xylenes	106	1330207	0.20	**ND**	ND
o-Xylene	106	95476	0.20	**ND**	ND
Surrogate Recovery Report			Spiked ppbv	Found ppbv	R%
1,4-Difluorobenzene (SS1)	118.1	540363	5.00	4.34	86.8
Bromofluorobenzene (SS2)	175	460004	5.00	2.72	54.4

*Comparison with the method blank this sample run with a dilution factor of: **1.0**
N: Not included in the Scope of NELAC Accrediation. Instrument calibration not performed for this analyte.
Analyte determined as tentatively identified compound (TIC).
*RESULTS Listed as 'ND' were not detected at or above the listed PQL (Practical Quantitation Limit).
* The control limit for Surrogate Recovery % of all spiked compound is 70% - 130%. Only one is required to pass.
*Concentrations in ug/cu M reported at 760 mm Hg pressure and 298 deg.K.
*QA/QC reports followed this report include: Method blank, Blank spike (BS) and Blank spike duplicate (BSD)

Respectfully submitted
GD Air Testing, Inc.

AJ for Dr. Dai
George Dai, Ph.D.
Laboratory Director

Data File: c:\Varian\100513-7-blk.sms
Report File: GD SRI\D\QC-10-TO14\Blank

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GD Air Testing Inc. www. gdair.com

CLIENT: **GD Air Testing, Inc.**

Project No.:

GD Air Testing Lab. ID:	**BS/BSD**
Report Date:	05/14/10
Date Analyzed:	05/13/10
Analyzed by:	LAJ
GD Air QC Batch:	**QC-051310**
Method:	EPATO14
NELAP Certification #:	***T104704364***

REPORT OF BLANK SPIKE RESULTS

Page 1 of 1

SAMPLE DESCRIPTION	MATRIX	SAMPLE BY	SAMPLED DATE /RECEIVED
BS/BSD	Air		

Spike Control Compounds	Spiked ppbv	BS/ppbv	Found and Recovery BS R%	BSD	BSD R%	% RPD
VOLATILE ORGANICS BY EPA TO-14						
Vinyl Chloride	10.0	9.2	92	9.3	93	1
Methylene chloride (Dichloromethane)	10.0	9.1	91	9.1	91	0
1,1,1-Trichloroethane	10.0	9.1	91	9.0	90	1
1,2-Dichloroethane (EDC)	10.0	9.1	91	8.8	88	3
Benzene	10.0	7.1	71	6.8	68	4
Carbon tetrachloride	10.0	7.4	74	7.0	70	6
Trichloroethene (TCE)	10.0	8.2	82	8.0	80	2
Toluene	10.0	11.0	110	11.4	114	4
Chlorobenzene	10.0	11.1	111	11.1	111	0
Ethylbenzene	10.0	11.5	115	11.3	113	2
o-Xylene	10.0	11.1	111	11.1	111	0
Surrogate Recovery Report						
1,4-Difluorobenzene (SS1)	5.0	4.25	85.0	4.06	81.2	4.6
Bromofluorobenzene (SS2)	5.0	2.66	53.2	2.78	55.6	4.4

* The control limit for BS Recovery % of all spiked compound is 70% - 130%
* The control limit for relative percentage difference of BS/BSD is 30%
* If any control compound is not within the control limit, please see the case narrative for more details.
* The control limit for Surrogate Recovery % of all spiked compound is 70% - 130%. Only one is required to pass.

Respectfully submitted
GD Air Testing, Inc.

AJ for Dr. Dai

George Dai, Ph.D.
Laboratory Director

Data File: VARIAN\100513-4-bs.sms and 100513-5-bsd.sms
Report File: GD\SRI\D:\QC-TO14\BS-BSD

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651 N. Plano Road, Suite 429, Richardson, TX 75081, USA • Tel: (972) 480-8908 • Fax (972) 480-8308

Appendix B

Initial Enquiry

--- On **Tue, 1/25/11, Richardson, Charles <Charles.Richardson@fwisd.org>** wrote:

From: Richardson, Charles <Charles.Richardson@fwisd.org>
Subject: RE: Information on leases
To: "'Libby Willis'" <libby59@sbcglobal.net>
Cc: "Johnson, Hank" <HANK.JOHNSON@fwisd.org>, "Berry, Connie" <Connie.Berry@fwisd.org>, "Cortez, Monica" <Monica.Cortez@fwisd.org>
Date: Tuesday, January 25, 2011, 1:57 PM

Good afternoon Ms. Willis,

Since we do not have this information nor did we request it as part of our Request for Bids I will be happy to forward your request to the energy companies, thanks.

From: Libby Willis [mailto:libby59@sbcglobal.net]
Sent: Sunday, January 23, 2011 11:00 PM
To: Richardson, Charles
Subject: Information on leases

Charles,

We continue to work on the project regarding the ISD mineral leases.

Would you ask the companies which bid on the 8 leases discussed by the board in mid-December for:

-- the diameter, pressure and location of each existing and projected pipeline serving wells in the 8 leases referenced above;

-- the API numbers for all wells in the 8 leases referenced above.

We need this information by February 4. If you are unable to get this information from the bidding companies, would you please let me know that by January 28?

Thank you very much.

Sincerely,

Libby Willis
FWLNA

XTO Energy Response

--- On **Wed, 1/26/11, Tarah_Angelidis@xtoenergy.com <Tarah_Angelidis@xtoenergy.com>** wrote:

From: Tarah_Angelidis@xtoenergy.com <Tarah_Angelidis@xtoenergy.com>
Subject: Re: FWISD Bid #10-169, 10-170
To: "Richardson, Charles" <Charles.Richardson@fwisd.org>
Cc: "'Jason R Beck'" <jason.r.beck@jpmorgan.com>, "'Libby Willis'" <libby59@sbcglobal.net>
Date: Wednesday, January 26, 2011, 10:06 AM

There are not any XTO outstanding bids that are being evaluated by the FWISD at this time. If/when XTO bids on the tracts that were discussed by the board in December, XTO will consider providing information at that time.

Thank you,

Tarah Fagen Angelidis
XTO Energy Inc.
(817) 885-3206
Fax (817) 885-1872

Chesapeake Energy Response

After the last enquiry in this thread, there was no further reply from Chesapeake Energy

From: Deborah Rogers <deborah300@sbcglobal.net>
Date: February 14, 2011 9:26:53 PM CST
To: Dolores Garza <dolores.garza@chk.com>
Subject: Re: API numbers

Thank you for the information on the "master plan".

As to the pipeline information and API numbers, why will you not provide it? You know as well as I that the RRC asks for these numbers in order to easily access well and pipeline data. This is not the first time I have requested basic pipeline information from Chesapeake and it has been refused. Is it company policy to withhold such information?

I would very much appreciate some help.

Deborah Rogers

Sent from my iPad

On Feb 14, 2011, at 7:32 PM, Dolores Garza <dolores.garza@chk.com> wrote:

Ms. Rogers,

In response to your e-mail, the Railroad Commission of Texas (www.rrc.state.tx.us or tel: 1-877-228-5740) may provide you with the well information you are seeking. The master development plan referenced at the school board meeting is located on our Ask Chesapeake website www.askchesapeake.com under the Barnett Shale Neighborhood Center, Fort Worth, Meerkat to Seminary.

Regards,

Dolores

From: Deborah Rogers [mailto:deborah300@sbcglobal.net]
Sent: Friday, February 11, 2011 7:10 PM
To: Dolores Garza
Subject: Re: API numbers

Ms. Garza,

We are due to finalize our report before that meeting. With all due respect, the FWISD staff requested this information from Chesapeake quite some time ago. There appears to be a reluctance on your part to comply. A simple explanation will suffice.

I look forward to receiving the information from you no later than Monday, 14 February please.

Thank you for your time and attention.

Deborah Rogers

On Feb 11, 2011, at 6:16 PM, Dolores Garza <dolores.garza@chk.com> wrote:

Ms. Rogers,

As I understand you will be attending with Ann Sutherland when she meets with us and at that time we will discuss your requests.

Regards,

Dolores Garza

From: Deborah Rogers [mailto:deborah300@sbcglobal.net]
Sent: Friday, February 11, 2011 11:44 AM
To: Dolores Garza
Subject: Re: API numbers

An addendum. Your representative at the school board meeting mentioned that Chesapeake has a "master plan" which was used to establish permits with the city. Could you also provide us with a copy of this plan please?

Thank you.

Deborah Rogers

On Feb 11, 2011, at 8:57 AM, Dolores Garza <dolores.garza@chk.com> wrote:

Ms. Rogers,

Thank you for your email. I'm briefly out of the office this morning and will follow up with you shortly.

Regards,

Dolores

From: Deborah Rogers [mailto:deborah300@sbcglobal.net]
Sent: Friday, February 11, 2011 8:25 AM
To: Dolores Garza
Subject: API numbers

Ms. Garza,

Just a friendly reminder about our request. I have not heard from you. We are under a deadline and would appreciate it very much if you would forward the information.

Deborah Rogers

Ms. Garza,

Since our meeting was cancelled and is not rescheduled until the end of the month, would you mind providing us

with the API numbers we requested? We are trying to re-search information on the wells.

Thank you for your help.

Deborah Rogers

--- On **Thu, 2/3/11, Dolores Garza <*dolores.garza@chk.com*>** wrote:

From: Dolores Garza <dolores.garza@chk.com>
Subject: FWLN Information Request:FWISD BID # 10-169,10-170,11-061, 11-064
To: '"libby59@sbcglobal.net"' <libby59@sbcglobal.net>
Cc: "John Gwynn" <john.gwynn@chk.com>, "Jason R Beck" <jason.r.beck@jpmorgan.com>, "Richardson, Charles" <Charles.Richardson@fwisd.org>
Date: Thursday, February 3, 2011, 10:27 PM

Hello Ms. Willis,

Hope you are doing well and keeping warm.

The FWISD sent your request to our Oklahoma City offices who forwarded your message to me.

I understand you will be in a meeting tomorrow with us and Trustee Sutherland. I'll be happy to discuss your request at that time and look forward to it.

Regards,

Dolores

Fort Worth League of Neighborhoods Report to ISD

Dolores G. Garza

Project Manager - Urban Development

Chesapeake Energy Corporation

100 Energy Way

Fort Worth, Texas 76102

Main: 817-502-5000

Direct: 817-502-4732

Cell: 817-487-1193

dolores.garza@chk.com

From: Richardson, Charles [mailto:Charles.Richardson@fwisd.org]
Sent: Wednesday, January 26, 2011 9:21 AM
To: John Gwynn
Cc: 'Jason R Beck'; 'Libby Willis'
Subject: FW: Information on leases, FWISD BID # 10-169,10-170,11-061, 11-064

Good morning Mr. Gwynn,

Please see the request from Libby Willis below. Since the district does not require this information in the bidding process I ask that you send your response to Ms. Willis, thank you.

From: Libby Willis [mailto:libby59@sbcglobal.net]
Sent: Sunday, January 23, 2011 11:00 PM
To: Richardson, Charles
Subject: Information on leases

Charles,

We continue to work on the project regarding the ISD mineral leases.

Would you ask the companies which bid on the 8 leases discussed by the board in mid-December for:

-- the diameter, pressure and location of each existing and projected pipeline serving wells in the 8 leases referenced above;

-- the API numbers for all wells in the 8 leases referenced above.

We need this information by February 4. If you are unable to get this information from the bidding companies, would you please let me know that by January 28?

Thank you very much.

Sincerely,

Libby Willis
FWLNA

Finley Resources response.

We never heard from Zachary Archer at Finley Resources.

--- On **Wed, 1/26/11, Clinton Koerth <*Clint@finleyresources.com*>** wrote:

From: Clinton Koerth <Clint@finleyresources.com>
Subject: RE: FWISD Bid 10-170
To: "Richardson, Charles" <Charles.Richardson@fwisd.org>
Cc: "'Jason R Beck'" <jason.r.beck@jpmorgan.com>, "'Libby Willis'" <libby59@sbcglobal.net>, "Wade Chappell" <WChappell@finleyresources.com>, "Zachary Archer" <ZArcher@finleyresources.com>
Date: Wednesday, January 26, 2011, 9:34 AM

Charles,

I am forwarding your request to the landman in charge, Zachary Archer. He will handle this request from here.

Clinton Koerth
Finley Resources Inc.
clint@finleyresources.com
817-231-8741 - direct

From: Richardson, Charles [mailto:Charles.Richardson@fwisd.org]
Sent: Wednesday, January 26, 2011 9:32 AM
To: Clinton Koerth
Cc: 'Jason R Beck'; 'Libby Willis'
Subject: FWISD Bid 10-170

Good morning Mr. Koerth,

Please see the request from Libby Willis. Since the district does not require this information in the bidding process I ask that you send your response to Ms. Willis, thank you.

Appendix C

Language giving the City of Ft. Worth jurisdiction comparable to TCEQ from the Texas Health and Safety Code. To date, the City has not exercised this power.

.Inspections: Section 382.111, Tex. Health & Safety Code, gives a local government – a "municipality" (city or town), a "county" or a Chapter 121 "health district" - the authority to enter, review records and inspect for violations, similar to the authority of TCEQ under 382.015, but limited to facilities within the jurisdiction of the local government. (Ch. 382 is the Texas Clean Air Act.)

§ 382.111. Inspections; Power to Enter Property

(a) A local government has the same power and is subject to the same restrictions as the commission under Section 382.015 to inspect the air and to enter public or private property in its territorial jurisdiction to determine if:

(1) the level of air contaminants in an area in its territorial

jurisdiction and the emissions from a source meet the levels set by:

(A) the commission; or

(B) a municipality's governing body under Section 382.113; or

(2) a person is complying with this chapter or a rule, variance, or

order issued by the commission.

(b) A local government shall send the results of its inspections to the commission when requested by the commission.

§ 382.015. Power to Enter Property

(a) A member, employee, or agent of the commission may enter public or private property, other than property designed for and used exclusively as a private residence hous-

ing not more than three families, at a reasonable time to inspect and investigate conditions relating to emissions of air contaminants to or the concentration of air contaminants in the atmosphere.

(b) A member, employee, or agent who enters private property that has management in residence shall:

(1) notify the management, or the person then in charge, of the

member's, employee's, or agent's presence; and

(2) show proper credentials.

(c) A member, employee, or agent who enters private property shall observe that establishment's rules concerning safety, internal security, and fire protection.

(d) The commission is entitled to the remedies provided by Sections 382.082-382.085 if a member, employee, or agent is refused the right to enter public or private property as provided by this section.

Enforcement: Section 7.351-.353, Tex. Water Code, provides that a local government is authorized to sue for injunctive relief and penalties for violations by facilities within the jurisdiction of the local government in the same manner as TCEQ could sue. TCEQ is a necessary party. The local government must pass a resolution authorizing the suit. Investigation and attorneys' fees are recoverable, as are ½ the penalties.

§ 7.351. Civil Suits

(a) If it appears that a violation or threat of violation of Chapter 16, 26, or 28 of this code, Chapter 361, 371, 372, or 382, Health and Safety Code, a provision of Chapter 401, Health and Safety Code, under the commission's jurisdiction, or Chapter 1903, Occupations Code, or a rule adopted or an order or a permit issued under those chapters or provisions has occurred or is occurring in the jurisdiction of a local government, the local government or, in the case of a violation of Chapter 401, Health and Safety Code, a

person affected as defined in that chapter, may institute a civil suit under Subchapter D in the same manner as the commission in a district court by its own attorney for the injunctive relief or civil penalty, or both, as authorized by this chapter against the person who committed, is committing, or is threatening to commit the violation.

(b) If it appears that a violation or threat of violation of Chapter 366, Health and Safety Code, under the commission's jurisdiction or a rule adopted or an order or a permit issued under that chapter has occurred or is occurring in the jurisdiction of a local government, an authorized agent as defined in that chapter may institute a civil suit under Subchapter D in the same manner as the commission in a district court by its own attorney for the injunctive relief or civil penalty, or both, as authorized by this chapter against the person who committed, is committing, or is threatening to commit the violation.

Appendix D

Health Information for Carbon Disulfide

The MSDS sheet for carbon disulfide states :

DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. MAY BE FATAL IF SWALLOWED OR INHALED. HARMFUL IF ABSORBED THROUGH SKIN. AFFECTS THE CENTRAL AND PERIPHERAL NERVOUS SYSTEMS. A DEVELOPMENTAL AND REPRODUCTIVE HAZARD. AFFECTS CARDIOVASCULAR SYSTEM, LIVER AND KIDNEYS.

Health Rating: 3 - Severe (Poison)

Flammability Rating: 3 - Severe (Flammable)

Reactivity Rating: 2 - Moderate

Contact Rating: 3 - Severe (Life)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:

Vapors cause irritation to the respiratory tract, followed by symptoms of headache, dizziness, fatigue, garlic breath, nausea, vomiting, and abdominal pains. Affects the central nervous system and peripheral nervous system. Overexposure may produce hallucinations, narcosis, unconsciousness, convulsions, and even death.

Ingestion:

TOXIC! Symptoms parallel those of inhalation. May cause permanent disabilities described below in Chronic Exposure.

Skin Contact:

May produce reddening and burning, cracking and peeling. Skin absorption can occur even in the presence of vapors, with toxic effects paralleling inhalation.

Chronic Exposure:

Kidney and liver damage, reproductive disorders, central and peripheral nervous system damage, vision problems, psychosis, and cardiovascular effects are associated with chronic exposure to Carbon Disulfide.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance. Affects the developing fetus.

Carbon disulfide is a known human reproductive hazard. Menstrual disorders, spontaneous abortions and premature births are reported in cases of chronic exposure.

http://www.npi.gov.au/substances/carbon-disulfide/source.html

http://www.npi.gov.au/substances/carbon-disulfide/health.html

http://www.who.int/ipcs/publications/cicad/cicad46_rev_1.pdf

http://www.jtbaker.com/msds/englishhtml/c0957.htm

APPENDIX E

OSHA and NIOSH recommended limits for carbon disulfide exposure

The allowable OSHA regulatory standard 8-hour average is 60 mg/m3, the 30 minute allowable is 90 mg/m3 and the max peak is 300 mg/m3. Additionally the NIOSH recommended limits are 3 mg/m3 8-hour average and 30 mg/m3 30 minute average.

Fort Worth League of Neighborhoods Report to ISD