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LAND RECYCLING PROGRAM SITE ASSESSMENT

CCS REALTY COMPANY

Cloverleaf Cold Storage
1000 Cunningham
Sioux City, Iowa

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Sioux City, Iowa

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1.0 EXECUTIVE SUMMARY

CCS Realty Company and K-F-Real Estate Company own the property located at 1000 Cunningham Drive in Sioux City, Iowa. The entire site, consisting of both parcels, is leased to Cloverleaf Cold Storage Company. Curly's Foods, Inc., a division of John Morrell & Company, subleases a portion of the site from Cloverleaf Cold Storage Company. A new building is currently being constructed on the property north of the existing cold storage building. The plan is for a third party to purchase the property and lease it to John Morrell & Company. on a long-term basis. A condition of the purchase is that the site receives a recordable No Further Action certificate by means of Iowa's Land Recycling Program (LRP). This Site Assessment was performed to meet the requirements of the LRP.

For this site assessment, 16 soil borings were advanced, and four groundwater monitoring wells installed to delineate contamination previously identified during a Phase II Environmental Site Assessment (ESA)[1] conducted by AMEC Earth and Environmental, Inc. (AMEC) in April 2004. Soil samples were collected in two ranges: Range 1 was less than two feet below ground surface (bgs) and Range 2 was deeper than two feet bgs. Analytical results were compared against statewide standards as an initial evaluation, then site-specific and, if necessary, background standards. The Site Location Map and Sample Location Map are in Appendix A.

Arsenic was present in all soil samples collected by AMEC in excess of the statewide standard. Because arsenic is naturally occurring in native Iowa soil, additional samples were not proposed in the Work Plan for this site, and were not collected. (The Work Plan is in Appendix B.) The arsenic concentrations were further evaluated by comparison to a background standard determined from arsenic concentrations at nearby properties. The on-site arsenic concentrations did not exceed the background standard.

A background standard was also developed for benzo(a)pyrene. The polycyclic aromatic hydrocarbon (PAH) contamination found at the site in is not likely attributable to the meat packing processes conducted there, but likely due to years of rail traffic adjacent to and across the site. A site to the south of Cloverleaf Cold storage has a similar pattern of PAH contamination and data from that site and other nearby sites were used to develop a background standard. Benzo(a)pyrene concentrations were defined to the background standard, except in the case of Range 1 soil for AOC3 (drum storage area) where further delineation was precluded by the presence of the cold storage building. Benzo(a)pyrene concentrations in each of the areas of concern (AOCs) exceeded statewide standards. In AOC1 (auto repair shop) and AOC2 (machine shop), the calculated cumulative health risks posed by the contamination was less than site-specific standards. AOC3 had a calculated cumulative health risk due to PAHs exceeding site-specific standards. (Calculations are in Appendix C.)

[1]AMEC Earth and Environmental, Inc., Smithfield Foods Property, Sioux City, Iowa, Draft Limited Phase II Environmental Site Assessment, April 27, 2004.

No contaminants were identified in any of the four groundwater samples. Groundwater is not a protected groundwater source. (Laboratory analytical reports are in Appendix D.)

Delineation of soil and groundwater contamination is complete. (See Appendices A and E.)

Remedy of environmental impairment is not recommended based on site-specific conditions, current City zoning and ordinance restrictions, and current or future industrial redevelopment plans.

Future redevelopment consideration should be pursued by: 1) restricting land use to non-residential, 2) prohibit onsite drinking water wells from the shallow alluvial aquifer, 3) maintaining the pavement over AOC3 and 3) disclosing the condition to future parties through deed recordation instruments.

These recommendations can be achieved by:

- Completing a Risk Evaluation/Response Action Plan.
- Maintaining non-residential zoning designation (such as the current Agribusiness Manufacturing designation).
- Enforcement of the current City ordinance prohibiting private drinking water wells within the corporate limits.
- Filing of property restrictions, including requirement for maintaining pavement and prohibition of well installation, or other appropriate instruments to ensure condition disclosure to future parties.

2.0 INTRODUCTION

The Cloverleaf Cold Storage site has been enrolled in Iowa's Land Recycling Program (LRP) in order to obtain a recordable no further action (NFA) certificate. The NFA certificate will make the property more attractive to prospective buyers and will be transferable with the property in the case that it is sold.

2.1 Purpose

The purpose of the LRP Site Assessment is to delineate soil and groundwater contamination identified during a Phase II Environmental Site Assessment (ESA) conducted in April 2004. This Site Assessment was conducted according to a Work Plan approved by the Iowa Department of Natural Resources (IDNR) and in accordance with Iowa Administrative Code (457B) Chapter 137: Iowa Land Recycling Program and Statewide Response Action Standards (IAC 137)

2.2 Problem Statement

The State of Iowa has in place through Iowa Administrative Code (IAC) and rules, programs for evaluation of environmental impairment. These include risk-based corrective action programs and a voluntary land recycling program administered by the IDNR. The programs overlap in some instances regarding regulation of environmental impairment and releases to soil, groundwater, and air. For the Cloverleaf project, soil and groundwater evaluations for public risk will be conducted according to IAC 137.

2.3 Background

Howard R. Green Company reviewed the Phase I[1] and Phase II ESAs prepared by National Assessment Corporation (NAC) and AMEC, respectively. The findings of the ESAs were evaluated to produce a hybrid investigation approach to meet the objectives of the property owner. The LRP targets affected areas defined by previous assessment, not entire properties. The sampling requirements are intended to address only the impacted portions of a property.

Howard R. Green Company considered use of a number of alternative sampling and assessment approaches used on other projects, including mobile field laboratories and direct-push technology. However, in view of the end use under IAC 137, the need for fixed-laboratory analyses and groundwater monitoring wells was required. This provides for the most direct application of the data produced to address state-level issues without multi-phasing.

2.4 Principal User

The principle end user of Site Assessment will be the property owner and LRP participant, CCS Realty Company. Further reliance by others will be beyond this Scope of Work. CCS Realty Company will make primary use of the data to aid in decision-making relative to considering the property for sale or redevelopment.

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[1] National Assessment Corporation, Phase I Environmental Site Assessment Report, Smithfield Foods Cloverleaf Cold Storage Plant #3, 1000 Cunningham Drive, Sioux City, Iowa, March 5, 2004.

3.0 SITE CHARACTERISTICS

CCS Realty Company owns most of the property located at 1000 Cunningham Drive in Sioux City, Iowa. K-F Real Estate, Company an affiliate of CCS Realty Company owns a small parcel located on the northeast corner of the subject site. The entire site, consisting of both parcels, is leased to Cloverleaf Cold Storage Company. Curly's Foods, Inc., a division of John Morrell & Company subleases the eastern half of the original building from Cloverleaf Cold Storage Company. A new building is being constructed on the property by CCS Realty Company. The current plan is for a third party to purchase the property and lease it to John Morrell & Company on a long-term basis. A condition of the purchase is that the site receives a recordable No Further Action by means of Iowa's Land Recycling Program.

3.1 Site Description and Features

From the Phase I ESA prepared by National Assessment Corporation (NAC) and dated March 5, 2004:

"The Property is located within an urban area of Sioux City, Iowa consisting predominantly of industrial and commercial land uses. Industrial uses in this area are characterized by numerous manufacturing/meat processing business that supply meat and other food related products for the food industry. There is little residential development in the vicinity. The Property is zoned MA by the City of Sioux City, which allows for agribusiness manufacturing development.

"The Property consists of an irregular-shaped parcel of industrially developed land totaling approximately 16.91 acres in size. The Site is designed and used for cold storage and meat processing purposes. Currently, the southern portion of the subject Site is improved with a multi-story, cold storage and meat process structure totaling approximately 180,000 SF [square feet] *of GBA* [gross building area]. *This building was constructed in phases, with the original building construction in 1930 and subsequent building additions between 1961 and 2003. Other on-site building improvements include the construction of two detached industrial warehouse structures. Site building 2 was constructed in 1978, and consists of a single-story structure measuring roughly 5,000 SF of GBA, and is currently vacant. This structure is located near the northwest corner of the Site. Site building 3 was constructed in 1979, and is comprised of a one-story warehouse structure totaling approximately 6,000 SF of GBA, which is currently utilized by Curly's Foods to store unused or broken meat processing equipment. This structure is located to the east of site building 2 in the northeast corner of the Property. The three site buildings have a combine total of approximately 191,000 SF of GBA of which roughly 40 percent is utilized for cold storage.*

"The vicinity of the Property can be described as commercial development (Stockyards Self Storage and Meier's Towing Automobile Impound Lot) to the north followed by Leach Avenue, with vacant commercial building beyond; Warrington Road and the Union Pacific railroad (sic Burlington Northern Santa Fe Railroad) *and associated railroad right-of-ways to the east followed by a ...mix of undeveloped land and commercial development (Vacant commercial building, T&S Enterprises Antique store, Hall Monument Company, Law Office, Iowa Better Trucking Bureau, vacant gasoline station, Modern Auto Sales Use Car Lot), with South Lewis Boulevard and a mix of undeveloped land and commercial development beyond; Cunningham Drive and industrial*

development (Siouxland Recovery Company) to the south followed by a vacant warehouse/office facility; and the Old Floyd River Floodway Drainage Channel to the west followed by a mix of undeveloped land, and industrial and commercial development (Meier Towing and Police Automobile Impound Lot, Global Foods, Heinold Hog Buyers, and Feed Energy), with Cunningham Drive and the former livestock stockyards.

"Access to the asphalt-surfaced Property parking lots on the northern and southern portions of the Property is provided from Warrington Road and Cunningham Drive, respectively. The Old Floyd River Drainage Channel, which runs parallel to the western Property boundary, receives surface runoff via underground conduits from various on-site surface drains located in the northern and southern Property parking surfaces. The southeast portion of the Property consists of undeveloped, grass-covered land. Railroad spurs providing access to the adjacent railroad traverse the southern portion of the Site. No other structures or significant surface features were noted on the Property at the time of the reconnaissance."[1]

3.2 Phase I Environmental Site Assessment

From the Phase I ESA prepared by National Assessment Corporation and dated March 5, 2004:

"...[T]he subject Property has been used as a cold storage/meat process facility since its original development in 1930. Prior to the current site development, the Property was industrially developed land.

"The Property was originally developed in the late 1800s for meat packing uses. The Property was utilized to operate various packing plants (Ed Haakinson & Co. Packing Plant, Sioux City Dressed Beef & Canning Co., and Cudahy Packing Plant) between 1890 and the early 1960's. Sioux City Cold Storage occupied the Property from the early 1960's to the late 1980's. The Property was purchased by the current owner in 1988, who has utilized the site buildings for cold storage and meat processing purposes."[2]

The recognized environmental conditions (RECs) investigated during the Limited Phase II ESA included:

- Storage tank locations identified on 1949 Sanborn Fire Insurance Map
- Railroad spurs
- Catch basins
- Auto repair shop
- Machine shop
- Drum storage area
- Fertilizer warehouse
- Transformer area
- Site-wide characterization (in lieu of trenching)[3]

[1] NAC, p. 8.

[2] NAC p. 21.

[3] AMEC, p. 2.

Delineation to the east of B-42 was prevented by the presence of the cold storage building. According to the Phase I ESA[1], the cold storage building was constructed in 1930. Additions were constructed later on the north and east sides. It is unlikely, that contamination would extend beneath the building since the property was undeveloped prior to that time and the contamination appears to be shallow, likely from rail activities.

In Range 2 soil samples, 12 SVOCs were identified. Of the 12 SVOCs, only benzo(a)pyrene at B-37, had a concentration above the calculated statewide standard of 0.31 mg/kg. In addition to benzo(a)pyrene, the previous investigation by AMEC identified arsenic and four additional SVOCs, benzo(a)anthracene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-c,d)pyrene in B-21 in concentrations exceeding statewide standards. The arsenic and SVOC concentrations were further evaluated against the site-specific cleanup standards in Section 5.4. Delineation of Range 2 for this AOC is complete. Analytical results are summarized in Tables 5 and 6 with the laboratory reports provided in Appendix D.

Table 5
Range 1 Soil Sample Results
mg/kg

Analyte	B-21A (2')	B-36 (2')	B-37 (2')	B-38 (2')	B-39 (2')	B-41 (2')	B-42 (2')	Calculated Statewide Standards
Acenaphthene	<0.080	<0.083	<0.039	1.6	<0.079	<0.37	17.2	3,300
Acenapthylene	<0.075	<0.077	<0.36	<0.37	<0.074	<0.37	2.2	No Standard
Anthracene	<0.050	<0.051	1.3	4.9	<0.050	<0.23	38.0	17,000
Benzo(a)anthracene	<0.045	<0.045	2.78	**8.03**	0.10	0.60	**51**	3.1
Benzo(b)fluoranthene	<0.048	<0.046	1.94	**6.36**	0.08	0.60	**40**	3.1
Benzo(k)fluoranthene	<0.063	<0.064	2.06	6.2	0.08	0.60	**37.6**	31
Benzo(a)pyrene	<0.063	<0.064	**2.37**	**7.41**	<0.062	**0.60**	**41**	0.31
Benzo(g,h,i)perylene	<0.050	<0.051	1.61	4.4	0.05	0.5	28.0	No Standard
Carbazole	<0.050	<0.051	0.46	2.7	<0.050	<0.23	10.3	130
Chrysene	<0.039	<0.039	2.8	8.77	0.10	0.84	53	310
Dibenzo(a,h)anthracene	<0.098	<0.10	<0.48	**1.1**	<0.097	<0.44	**6.48**	0.31
Dibenzofuran	<0.061	<0.061	<0.29	0.86	<0.06	<0.27	11.0	240
Fluoranthene	<0.046	<0.047	6.78	20.2	0.20	2.1	140	2,300
Fluorene	<0.067	<0.069	0.57	2.1	<0.066	<0.30	21.0	2,300
Indeno(1,2,3-c,d)pyrene	<0.040	<0.040	1.45	**4.7**	0.06	0.5	**31.3**	3.1
2-Methylnaphthalene	<0.081	<0.084	<0.40	0.5	<0.08	<0.37	1.4	240
Naphthalene	<0.093	<0.096	<0.45	1.2	<0.092	<0.42	0.88	1,100
N-Nitrosodiphenylamine	<0.044	<0.044	<0.21	<0.21	<0.043	<0.19	0.58	530
Phenanthrene	<0.049	<0.049	5.92	17.2	0.14	1.7	74.9	No Standard
Pyrene	<0.065	<0.065	5.65	15.3	0.17	1.4	102	1,700

[1] NAC, p. 10.

Table 6
Range 2 Soil Sample Results
mg/kg

Analyte	AMEC[1] B-21 (2.4')	B-36 (6')	B-37 (9')	B-38 (9')	B-38 (14')	Calculated Statewide Standards
Arsenic	**16.3**	NS	NS	NS	NS	1.9
Mercury	0.095	NS	NS	NS	NS	23
Barium	306	NS	NS	NS	NS	5,500
Cadmium	1.64	NS	NS	NS	NS	3.1
Chromium	15.8	NS	NS	NS	NS	230
Lead	94.1	NS	NS	NS	NS	400
Anthracene	6.0	<0.050	0.83	<0.054	<0.055	17,000
Benzo(a)anthracene	**12**	<0.045	1.76	<0.049	<0.049	3.1
Benzo(b)fluoranthene	**10**	<0.048	1.3	<0.052	<0.052	3.1
Benzo(k)fluoranthene	3.8	<0.063	1.33	<0.069	<0.069	31
Benzo(a)pyrene	**9.5**	<0.063	**1.71**	<0.069	<0.069	0.31
Benzo(g,h,i)perylene	4.3	<0.050	1.1	<0.054	<0.055	No Standard
Carbazole	NR[2]	<0.050	0.36	<0.054	<0.055	130
Chrysene	12	<0.039	1.88	<0.042	<0.042	310
Dibenzo(a,h)anthracene	**0.36**	<0.098	<0.50	<0.11	<0.11	0.31
Dibenzofuran	1.2	<0.060	<0.31	<0.066	<0.066	240
Fluoranthene	25	<0.046	4.05	<0.050	<0.051	2,300
Fluorene	1.8	<0.067	<0.35	<0.074	<0.073	2,300
Indeno(1,2,3-c,d)pyrene	**5.3**	<0.040	1.0	<0.043	<0.044	3.1
2-Methylnaphthalene	0.7	<0.081	<0.42	<0.090	<0.089	240
Naphthalene	0.82	<0.093	<0.48	<0.10	<0.10	1,100
Phenanthrene	24	<0.049	3.87	<0.053	<0.054	No Standard
Pyrene	26	<0.064	3.79	<0.070	<0.070	1,700

AOC4 – Site-Wide Characterization

No additional soil samples were collected for arsenic analysis. Figure 6 in Appendix A shows the locations of samples previously collected that were used to determine background arsenic concentrations as discussed in Section 5.4 of this report.

[1] AMEC, Table 3.

[2] NR = not reported

5.2.2 Groundwater Assessment

Two of the of the 16 soil borings were completed as groundwater monitoring wells and two additional soil borings advanced solely for monitoring well installation. Four groundwater monitoring wells, MW-1, MW-2, MW-3 and MW-4 were installed to determine if the total extractable hydrocarbons (TEH) contamination detected by AMEC in B-4A was leaving the property and additionally to determine if groundwater was impacted by SVOCs. Groundwater was encountered at depths ranging from approximately 3' to 13' bgs. The wells were constructed of 2" PVC casing and completions were approximately 0.5 feet bgs. Well construction details are provided in Appendix E.

Groundwater flow direction was determined during this Site Assessment to be in a westerly direction. (Refer to Figure 3 in Appendix A.)

AOC5 – Storage Tank Locations

Prior to sampling each well the depth to water was measure, the well developed, then allowed to stabilize. All samples were analyzed for TEH by Iowa Method OA-2. One additional sample from MW-3 was analyzed for SVOCs by EPA Method SW 8270C. Neither TEH nor SVOCs were detected in any of the samples.

5.3 Nature of the Source of Contamination

The subject site has been in industrial use, mainly meat packing, since the late 1800s. The contaminants found at the site are not normally associated with meatpacking but are more often associated with rail yards due to the use of such materials as cutting fluids, diesel fuel, herbicides, lubricants, and such raw materials as arsenic, coal and creosote.[1] The subject site is adjacent to a railroad and has an existing spur along the west side of the property where a "hot spot" of PAHs was identified and formerly had a spur on the north side of the building where additional "hot spots" of PAHs were found. The pattern of elevated arsenic and PAHs is also found at the nearby Former Floyd Valley Packing Plant, which is also adjacent to the railroad and has an on-site rail yard.

5.4 Local Maxima Evaluated Against Relevant Standards

AOC1 – Auto Repair Shop

The maximum concentrations of contaminants associated with the auto repair shop in Range 1 and Range 2 soil occurred at soil boring B-15 and B-15A which in Range 1 soil had benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene and indeno(1,2,3-c,d)pyrene in concentrations higher than the statewide standards. In Range 2 soil arsenic, benzo(a)anthracene, benzo(b)fluoranthene and benzo(a)pyrene exceeded the statewide standards. Benzo(a)pyrene for both ranges also exceeded the background standard of 1.91 mg/kg whereas arsenic, analyzed only in Range 2 was below the background standard of 26.7 mg/kg.

[1] Shineldecker, Chris L. *Handbook of Environmental Contaminants: A Guide for Site Assessment*, Lewis Publishers, Chelsea: 1992, p. 286.

To determine if the contamination in B-15 exceeds site-specific standards, the cumulative increased health risks were evaluated for each cancer group of contaminants, if any in the group exceeded a statewide standard.

Range 1
The Group A and B contaminants had a cumulative cancer risk for the ingestion and adsorption pathways of 4.20E-05. This is less than 1.0E-04, which is the maximum allowable increased cancer risk for a non-residential site.

Group C, D, and E contaminants did not require evaluation because none of these contaminants exceeded a statewide standard in Range 1. Calculations are in Appendix C.

Range 2
The Group A and B contaminants had a cumulative cancer risk for the ingestion and adsorption pathways of 2.13E-06. This is less than 1.0E-04, which is the maximum allowable increased cancer risk for a non-residential site.

Group C contaminants had a cumulative increased health risk of 1.23E-01, which exceeds the allowable increased health risk of 1.0E-01. The contributors to this exceedance are arsenic and cadmium. Arsenic, at 12.3 mg/kg, is well below the background standard of 26.7 mg/kg. Since cleanup is not required to below a background standard, no action is required in this soil range at this location.

Group D and E contaminants did not require evaluation because none of these contaminants exceeded a statewide standard in Range 2. Calculations are in Appendix C.

AOC2 – Machine Shop
The maximum concentrations of contaminants associated with the machine shop in Range 1 and Range 2 soil occurred at soil boring B-19, which in Range 1 soil had a benzo(a)pyrene concentration higher than the statewide standard. In Range 2 soil, arsenic, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene and indeno(1,2,3-c,d)pyrene exceeded the statewide standards. Benzo(a)pyrene in Range 2 also exceeded the background standard of 1.91 mg/kg whereas arsenic, analyzed only in Range 2 was below the background standard of 26.7 mg/kg.

Range 1
The only contaminant in excess of a statewide standard was benzo(a)pyrene. Because the benzo(a)pyrene was less than the background standard, no evaluation was required for Range 1 soil.

Range 2
The Group A and B contaminants had a cumulative cancer risk for the ingestion and adsorption pathways of 4.63E-06. This is less than 1.0E-04, which is the maximum allowable increased cancer risk for a non-residential site.

Group C contaminants had a cumulative increased health risk of 6.39E-02, which is less the allowable increased health risk of 1.0E-01.

Group D and E contaminants did not require evaluation because none of these contaminants exceeded a statewide standard in Range 2. Calculations are in Appendix C.

AOC3 –Drum Storage Area

The maximum concentrations of contaminants associated with the drum storage area in Range 1 occurred at soil boring B-42 which had benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene and indeno(1,2,3-c,d)pyrene concentrations higher than their statewide standards. In Range 2, soil boring B-21 had arsenic, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene and indeno(1,2,3-c,d)pyrene in concentrations exceeding the statewide standards. In both soil ranges, benzo(a)pyrene also exceeded the background standard of 1.91 mg/kg whereas arsenic, analyzed only in Range 2 was below the background standard of 26.7 mg/kg.

Range 1

The Group A and B contaminants had a cumulative cancer risk for the ingestion and adsorption pathways of 2.57E-04. This is higher than 1.0E-04, which is the maximum allowable increased cancer risk for a non-residential site.

Group C, D and E contaminants did not require evaluation because none of these contaminants exceeded a statewide standard in Range 1. Calculations are in Appendix C.

Range 2

The Group A and B contaminants had a cumulative cancer risk for the ingestions and adsorption pathways of 5.72E-06. This is less than 1.0E-04, which is the maximum allowable increased cancer risk for a non-residential site.

Group C contaminants had a cumulative increased health risk of 1.62E-01, which exceeds the allowable increased health risk of 1.0E-01. The contributors to this exceedance are arsenic, cadmium and naphthalene. Arsenic, at 16.3 mg/kg, is well below the background standard of 26.7 mg/kg. Since cleanup is not required to below a background standard, no action is required in this soil range at this location.

Group D and E contaminants did not require evaluation because none of these contaminants exceeded a statewide standard in Range 2. Calculations are in Appendix C.

AOC4 – Site-Wide Characterization

Arsenic concentrations in soil collected by AMEC during Phase II ESA activities were all below the background standard of 26.7 mg/kg. No action is required regarding arsenic.

AOC5 – Storage Tank Locations
Although TEH as diesel (TEH-d) was identified by AMEC in the temporary monitoring well located at B-4, further sampling at the property lines has not identified any TEH-d leaving the property. Groundwater contamination by SVOCs has not been found, either.

5.5 Site Stratigraphy

The Soil Survey of Woodbury County describes the soils in the vicinity of the subject site as belonging to the McPaul, Albaton and Blake Soil Series. The areas where these soils are found have 0 to 1 percent slope. They are generally found in areas built up before the soils were surveyed. The McPaul soils are more extensive in this undifferentiated group. They formed in sediments deposited by such tributary streams as the Floyd River. The Albaton and Blake soils are the main soils of this unit that formed in sediments deposited by the Missouri River.

Both the Phase II ESA and this Site Assessment found from two to eight feet of fill material overlying clay and silty clay soil with occasional sand or gravel lenses. AMEC noted roots and iron staining in several soil borings as well as product staining and odor in several borings. This Site Assessment, performed in July 2004 found groundwater to be at between 3 and 13 feet bgs. Soil boring logs are in Appendix E.

5.6 Hydrologic Properties

Aquifer testing in the form of bail down tests was conducted on MW-2, MW-3, and MW-4. Data was logged with a Hermit Data logger or equivalent. Hydraulic conductivity, when data was reduced using the Bower-Rice method, was 0.0418, 0.38, and 0.0264 meters/day (m/day), respectively. A protected groundwater source is an aquifer with a hydraulic conductivity of greater than 0.44 m/day per IAC Chapter 135. The aquifer at the Cloverleaf site does not qualify as protected groundwater. Aquifer test results are in Appendix F.

5.7 Physical and Chemical Properties

According to the Soil Survey of Woodbury County the soils in the vicinity of the site have moderate to high clay content with low organic matter content (0 to 3 percent). The moist bulk density ranges from 1.25 to 1.45 grams per cubic centimeter (gr/cc). Saturated hydraulic conductivity ranges from 8.6E-4 to 1.2 m/day.

5.8 Topographic and Cultural Features

According to the Phase I ESA prepare by NAC the features of the site can be described as follows:

"The Cloverleaf Cold Storage Plant #3...encompasses three tracts of industrially developed land totaling 16.91 acres in size. Cloverleaf Cold Storage, a public storage company, and Curly's Foods, Inc., a division of John Morrell, a wholly owned subsidiary of Smithfield Foods, currently occupies the Property. The southern portion of the subject Site is comprise of a multi-story, cold storage and meat processing structure totaling approximately 180,000 square feet (SF) of gross building area (GBA). Other building improvements include the construction of two detached industrial warehouse structures. For clarity purposes, the two detached structures will be refereed to as site buildings 2 and 3. Site building 2 consists of a single-story structure measuring roughly 5,000 SF of GBA, and is currently vacant. This structure is located near the northwest corner of the

Site. Site building 3 is comprised of a one-story warehouse structure totaling approximately 6,000 SF of GBA, which is currently utilized by Curly's Foods to store unused or broken meat processing equipment. This structure is located to the east of site building 2 in the northeast corner of the Property. The three site buildings have a combined total of approximately 191,000 SF of GBA, of which roughly 40 percent is utilized for cold storage.

"The original site building's superstructure consists of concrete and brick walls and decks, concrete slab-on-grade construction, with brick veneer and a low-pitched roof. The original building, constructed in 1930, consisted of approximately 36,812 square feet of GBA. Subsequent building additions primarily to the north end and east side of the original building were constructed between 1960 and 2001. The original roof consists of a built-up roof supported by a combination wood deck with wood joists, and concrete columns and beams, and concrete deck with reinforced structural steel. Changes to the original superstructure resulting from subsequent building additions vary from concrete tilt-up construction to concrete masonry block walls, with slab-on-grade construction, belly paneling, and low-pitched built-up roof systems. The subsequent roof systems are supported by either concrete decking with reinforced structural steel or metal decking supported by structural steel framing. Interior finish materials throughout the main structure include unpainted concrete ceilings; lay-in ceiling tile; drywall, concrete, and concrete block walls; vinyl floor tile; carpet; and vinyl baseboard.

"The western half of the original site building, currently occupied by Cloverleaf Cold Storage, is primarily utilized for cold storage purposes, with seven ground floor commercial freezer compartments. The remaining interior space consists of office space, dry goods storage areas, a mechanical room (referred to as the "engine room"), a lead-acid battery charging room, an enclosed loading dock, and a seven-story cable pulley freight elevator. The upper level interior building areas are comprised of dry goods storage areas, refrigerated storage areas, office space, various roof access entryways, and an elevator equipment room.

"The eastern half of the original site building, currently occupied by Curly's Foods, Inc., is predominantly utilized for commercial meat processing purposes. The interior building area is comprised of office space, employee locker rooms, employee break rooms, a boiler room, a chemical hot water heating system room, an on-site food analysis laboratory used for quality control (QC) purposes, a conference room, various storage areas, two loading docks, and a maintenance shop. The interior areas of the meat processing space include a raw rib room, prep rooms 1 and 2, and oven room, and a blast freezer room...

"Site building 2, also known as the former scientific protein laboratory (SPL) building was constructed in 1978 and consists of "twin tee" pre-cast concrete structural walls and roof system, with concrete slab-on-grade construction and a low-pitched roof. An empty concrete containment vault is attached to the west side of this building. The interior of this structure consists primarily of vacant warehouse spaced, with a small office area, restrooms, and an employee break room. Interior finish materials consist of concrete.

"Site building 3 was constructed in 1979 and consists of a concrete masonry block foundation with pre-fabricated metal walls, slab-on-grade construction, and a steep-pitched metal roof supported by structural steel framing. A small concrete addition is attached to the southeast corner of the building. The interior of this structure consists of open warehouse.

"Other improvements to the Property include concrete sidewalks; greenways; open-surface asphalt pavement parking areas; three concrete pavement loading docks; storm water drainage system; and two railroad spurs. No other site improvements to the Property were noted. Access and egress to the Property can be made via Warrington Road from the east and via Cunningham Drive from the south. The Property is presently designated MA (agribusiness manufacturing land uses) by the Sioux City, Planning and Zoning Department, and is considered a legal use in its current configuration."[1]

The Phase I ESA describes the topography of the sites as follows:

"According to the contour lines on the [USGS Sioux City 7.5 minute series] *topographic map, the Property is located an approximate elevation of 1,100 feet above mean sea level (MSL). The contour lines in the area of the Property indicate the area is relatively level with a gently slop to the south.*

"Based on review of the topographic map and observations made during the on–site reconnaissance, the Property appears to be generally flat, with no noticeable slope. The subject Site has engineered slopes around the site building and parking areas for positive drainage…

"The primary regional drainage features are the Missouri River to the south, the old Floyd River channel on the east, and the new Floyd River Flood Control Channel on the west side of the stockyards. The old Floyd River channel is a 1940's Army Corps of Engineers flood control project in which the original channel was straightened and lined with concrete. The normal surface water elevation of the Missouri River is listed as 1,080 feet above msl. The old Floyd River channel was abandoned in 1966 with the construction of a larger flood control channel approximately 1,400 feet to the northwest. The old Floyd River channel still receives outflow from Bacon Creek and the City's storm water sewer system."[2]

5.9 Stability of Contamination

Indications are that contamination at the Cloverleaf Cold Storage site is stable. The contamination in the soil is likely the result of rail traffic at the site and has likely been present for many years. Arsenic and PAHs are less mobile in the environment when compared with more common contaminants such as benzene. Table 7, below, compares values for solubility, vapor pressure and organic carbon partition coefficient (K_{oc}) with that of benzene.

[1] NAC, pp. 1-2.

[2] NAC, p. 18.

Table 7
Fate and Transport Factors[1]

Analyte	Water Solubility (mg/L)	Vapor Pressure (mm Hg)	K_{oc} (mL/g)
Benzene (as reference)	**1.75E+03**	**9.52E+01**	**8.30E+01**
Arsenic	NA[2]	0.00E+00	NA
Benzo(a)anthracene	5.75E-03	2.20E-08	1.38E+06
Benzo(a)pyrene	1.20E-03	5.60E-09	5.50E+06
Benzo(b)fluoranthene	1.40E-02	5.00E-07	5.50E+05
Benzo(k)fluoranthene	4.30E-03	5.10E-07	5.50E+05
Dibenzo(a,h)anthracene	5.00E-04	1.00E-10	3.30E+06
Indeno(1,2,3-c,d)pyrene	5.30E-04	1.00E-10	1.60E+06

Groundwater contamination by TEH-d was found at only one location in one sample by AMEC. Further sampling for SVOCs at that location did not detect any contamination above standards. There is no evidence that contamination is migrating off-site.

5.10 Receptor and Exposure Concerns

There are no concerns regarding groundwater at the site. There are no drinking water wells on site and contamination does not appear to be migrating off-site. The concentration of TEH-d identified in the groundwater by AMEC is less than the Tier 1 values for potential drinking water ingestion, vapor, plastic water line and surface water receptors.

The only area at the site with potential exposure concerns would be the Range 1 soil at AOC3, the former drum storage area. The calculated cumulative health risk in this area exceeds allowable limits. Neither the Range 2 soils nor groundwater in the area were found to have contamination above site-specific standards, which indicates that near-surface contamination is not migrating. The area is paved, however, so the potential for exposure is minimal. The other soil AOCs, AOC1, AOC2 and AOC4 all had contaminant concentrations less than the site-specific standards.

Risk and exposure concerns are tabulated below:

[1] EPA/600/8-90/003, Basics of Pump-and-Treat Ground-Water Remediation Technology, March 1990, Table A-1.

[2] NA = not available

Table 8
Exposure Pathways

Media	Exposure Pathway	Receptor	TEH-d	Arsenic	PAHs
Groundwater	Ingestion	Actual	Clear--No actual receptors	NA	NA
		Potential	Clear—TEH-d concentration is less than the Tier 1 value of 75,000 ug/L	NA	NA
	Vapor	All	Clear—TEH-d concentration is less than the Tier 1 value of 2,200,000 ug/L	NA	NA
	Plastic Water Line	All	Clear—TEH-d concentration is less than the Tier 1 value of 75,000 ug/L	NA	NA
	Surface Water	All	Clear—TEH-d concentration is less than the Tier 1 value of 75,000 ug/L	NA	NA
Soil	Ingestion	All	NA	Clear—Below background standards	Potential concern for AOC3
	Vapor	All	NA	NA	NA
	Dermal Contact	All	NA	Clear—Below background standards	Potential concern for AOC3

5.11 Future Use

The use of the property is not likely to change in the foreseeable future. A new building is currently being constructed on site for additional meatpacking capability.

6.0 FINDINGS AND CONCLUSIONS

Arsenic concentrations present in all soil samples, previously collected by AMEC, exceeded the statewide standard. The arsenic concentrations were further evaluated by comparison to a background standard and concentrations did not exceed the background standard.

Benzo(a)pyrene concentrations were defined to the background standard, except in the case of AOC3 where further delineation was precluded by the presence of the cold storage building. Benzo(a)pyrene concentrations in each of the areas of concern exceeded statewide standards. In AOC1 and AOC2, the calculated cumulative health risks posed by the contamination was less than site-specific standards. AOC3 has a calculated cumulative health risk due to PAHs exceeding site-specific standards.

No contaminants were identified in any of the four groundwater samples. Groundwater is not a protected groundwater source.

Delineation of soil and groundwater contamination is complete.

7.0 RECOMMENDATIONS

Remedy of environmental impairment is not recommended based on site-specific conditions, current City zoning and ordinance restrictions, and current or future industrial redevelopment plans.

Redevelopment consideration should be pursued by: 1) restricting land use to non-residential, 2) prohibit onsite drinking water wells from the shallow alluvial aquifer, 3) maintaining the pavement over AOC3 and 3) disclosing the condition to future parties through deed recordation instruments.

These recommendations can be achieved by:

- Completing a Risk Evaluation/Response Action Plan.
- Maintaining non-residential zoning designation (such as the current Agribusiness Manufacturing designation).
- Enforcement of the current City ordinance prohibiting private drinking water wells within the corporate limits.
- Filing of property restrictions, including requirement for maintaining pavement and prohibition of well installation, or other appropriate instruments to ensure condition disclosure to future parties.