Public Health Consultation
Evaluation of Private Drinking Water Well Samples

Coronet Industries

EPA I.D. No. FL000170474

Prepared by
Florida Department of Health
Under Cooperative Agreement with
U.S. Department of Health and Human Services

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Foreword

This document summarizes public health concerns related to drinking water from private wells near a phosphate processing plant in Plant City, Florida. It is based on a site evaluation prepared by the Florida Department of Health (DOH). A number of steps are necessary to do such an evaluation:

Evaluating exposure: Florida DOH scientists begin by reviewing available information about environmental conditions at the site. The first task is to find out how much contamination is present, where it is found on the site, and how people might be exposed to it. Usually, Florida DOH does not collect its own environmental sampling data. Florida DOH relies on information provided by the Florida Department of Environmental Protection (DEP), U.S. Environmental Protection Agency (EPA), and other government agencies, businesses, and the public.

Evaluating health effects: If there is evidence that people are being exposed, or could be exposed, to hazardous substances, Florida DOH scientists will take steps to determine whether that exposure could be harmful to human health. The report focuses on public health (the health impact on the community as a whole), and is based on existing scientific information.

Developing recommendations: In the evaluation report, Florida DOH outlines its conclusions regarding any potential health threat posed by a site, and offers recommendations for reducing or eliminating human exposure to contaminants. The role of Florida DOH in dealing with hazardous waste sites is primarily advisory. For that reason, the evaluation report will typically recommend actions to be taken by other agencies, including the EPA and Florida DEP. However, if there is an immediate health threat, Florida DOH will issue a public health advisory warning people of the danger, and will work to resolve the problem.

Soliciting community input: The evaluation process is interactive. Florida DOH starts by soliciting and evaluating information from various government agencies, the organizations responsible for cleaning up the site, and the community surrounding the site. Any conclusions about the site are shared with the groups and organizations that provided the information. Once an evaluation report has been prepared, Florida DOH seeks feedback from the public.

If you have questions or comments about this report, we encourage you to contact us.

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Background and Statement of Issues

In January 2003, a resident of Plant City, Florida petitioned the Agency for Toxic Substances and Disease Registry (ATSDR) to investigate illnesses in the area of a former phosphate mine and the Coronet Industries phosphate processing facility (Coronet). Both the mine and the facility are southeast of Plant City, in Hillsborough County, Florida. The Florida Department of Health (DOH), under its cooperative agreement with ATSDR, prepared a brief scoping report identifying potential exposure sources related to previous and current Coronet operations. This health consultation focuses on the public health concerns of drinking untreated area groundwater.

Since 1906, Coronet Industries and its predecessors mined and processed phosphate rock southeast of Plant City. They mined phosphate rock from areas mainly north of the Coronet facility using a shallow excavation technique (less than 25 feet below land surface). After they mined all usable phosphate rock from the site, they shipped phosphate rock to the facility from other areas of Florida. Coronet uses the phosphate rock to manufacture alpha tricalcium phosphate, an animal feed supplement. Coronet also produces potassium fluoborate, a boron-containing product.

Local citizens are concerned that Coronet's activities might be harming their health. In 2003, a local resident petitioned the Agency for Toxic Substances and Disease Registry (ATSDR) in Atlanta, Georgia, claiming that mined areas later filled in with garbage were negatively affecting health in the communities. Also in 2003, the Florida DOH prepared a brief scoping report for the ATSDR documenting environmental releases and potential exposure sources for the communities surrounding the plant.

The Florida Department of Environmental Protection (DEP) and the Hillsborough County Health Department (HCHD) tested approximately 145 area wells for metals and volatile organic compounds. The Florida DOH tested 43 of these wells for gross alpha radiation. Of these 43, the Florida DOH tested wells with more than 5 picocuries per liter (pCi/L) of gross alpha radiation for radium 226/228 and uranium.

Testing of drinking water wells within approximately ¼ mile of the Coronet facility boundary identified several metals and radium 226/228 in groundwater at levels above the Florida DEP's Maximum Contaminant Levels (MCLs). Residents east and south of the Coronet facility use groundwater as a drinking water source. It is not clear if these levels are natural or are the result of human activities.

For current drinking water exposures, the ATSDR categorizes groundwater (i.e., groundwater used for drinking water) east and south of the Coronet plant as a **no apparent public health hazard**. This is because contaminants found in drinking water above primary drinking water standards are not at levels expected to cause widespread illness in the community. Realistic exposure scenarios do not generate an exposure dose large enough to the represent an imminent health threat.

Residents with contaminants above a primary (health-based) standard are currently drinking bottled water. This was a prudent action taken to be protective of public health until more data could be obtained and analyzed. In the past, drinking water from wells with arsenic below 50 micrograms per liter (µg/L) was not considered a hazard. More recently, a federal drinking water arsenic standard of 10 µg/L has been proposed and is expected to go into effect soon. However, new studies of U.S. populations show no increased incidence of bladder cancer from drinking water with less than 50 µg/L arsenic (Lamm 2003; Steinmaus 2003).

Community Health Concerns

During meetings with individual residents and at a public meeting held by local and state government environmental and health agencies in August 2003, residents expressed a variety of health concerns they believed Coronet Industries caused, including:

- High rates of cancer,
- Fertility problems, and
- Illnesses from drinking contaminated groundwater.

Local citizens also expressed many other health concerns. This health consultation addresses only those concerns related to groundwater as a drinking water source. Florida DOH will address other health concerns in future health consultation and public health assessments.

Discussion

Private Drinking Water Well Test Results and Standards

Between August and December 2003, the Hillsborough County Health Department (HCHD) and Florida Department of Environmental Protection (DEP) tested approximately 145 private drinking water wells east and south of the Coronet Industries property. The Florida DEP and the HCHD tested drinking water wells to identify contaminants in area groundwater. Area groundwater is a drinking water source for people living near the Coronet facility. Most of the tested wells are within ¼ mile of the Coronet property boundary. The Coronet plant and wastewater ponds are a potential source of contaminants in area groundwater (Florida DEP and Hillsborough CHD 2003).

The HCHD and Florida DEP collected samples using approved state methods for water collection and analysis. They tested samples for volatile organic compounds (VOCs) and primary and secondary metals, as well as for boron and fluoride. Of the 145 water samples, 43 had gross alpha radiation testing. These 43 wells were in the first round of testing. For wells with gross alpha radiation greater than 5 picocuries per liter (pCi/L), the Florida Department of Health (DOH) tested for radium 226/228 and uranium radiation.

Of the approximately 145 wells tested, approximately 32 (22%) had levels of arsenic, boron, cadmium, lead, sodium, thallium or radionuclides above state maximum contaminant levels (MCLs) or state health advisory levels (HALs). As a precautionary measure, the Florida DEP provided these residents with bottled water. This health consultation describes health-related exposures from drinking untreated groundwater.

Florida DOH used the following standard comparison values (ATSDR 2002 and Florida DEP 2000) in order of priority, to select contaminants of concern:

1. EMEGs (Environmental Media Evaluation Guides) – The ATSDR derives EMEGs from Minimal Risk Levels (MRLs) using standard exposure assumptions, such as ingestion of 2 liters of water per day and body weight of 70 kg for adults. MRLs are estimates of daily human exposure, generally for a year or longer, to a chemical likely to be without an appreciable risk of non-cancerous illnesses. EMEGs used in this report were either for chronic ($\geq$365 days) or intermediate (15–364 days) exposures, where established.
2. MCLs (Maximum Contaminant Levels) – The Florida Department of Environmental Protection (DEP) derives MCLs from U.S. Environmental Protection Agency (EPA) standards or from health data compiled from state and federal resources. MCLs are fully

enforceable standards and must be equal to or more stringent (i.e., lower) than federal MCLs (such as the EPA's).

3. HALs (Health Advisory Levels) – The Florida Department of Environmental Protection (DEP) and Florida Department of Health (DOH) set HALs based on U.S. Environmental Protection Agency (EPA) standards or from health data compiled from state and federal agencies. While not enforceable, the state agencies use HALs to protect human health.

Using the components and criteria listed above, the Florida DOH selected seven of the test parameters as contaminants of concern: **arsenic, boron, cadmium, lead, sodium, thallium** and **radium 226/228**. Identification of a contaminant of concern in this section does not necessarily mean that exposure will cause illness. Rather, identification serves to narrow the focus of the health consultation to those contaminants most important to public health. The Florida DOH evaluates contaminants of concern and estimates whether exposure is likely to cause illness (ATSDR 1992a).

Contaminants in Private Drinking Water Wells above a Health-Based MCL or HAL

Arsenic – arsenic was above the pending MCL of 10 micrograms per liter (µg/L) in 12 of the 145 wells. Arsenic above the MCL ranged from 10.8 µg/L to 49.7 µg/L.

Boron – boron was above the HAL of 600 micrograms per liter (µg/L) in 11 of the 145 wells. Boron above the HAL ranged from 730 µg/L to 17000 µg/L.

Cadmium – cadmium was above the MCL of 5 micrograms per liter (µg/L) in 2 of the 145 wells. Cadmium above the MCL ranged from 6.5 µg/L to 7.2 µg/L.

Lead – lead was above the MCL of 15 micrograms per liter (µg/L) in 2 of the 145 wells. Lead above the MCL ranged from 22 µg/L to 23 µg/L.

Sodium – sodium was above the MCL of 160,000 micrograms per liter (µg/L) in 3 of the 145 wells. Sodium above the MCL ranged from 200,000 µg/L to 250,000 µg/L.

Thallium – thallium was above the MCL of 2 micrograms per liter (µg/L) in 1 of the 145 wells. Thallium above the MCL was detected at 5.9 µg/L.

Radionuclides – radium 226/228 was above the MCL of 5 picocuries per liter (pCi/L) in 14 of 43 wells with gross alpha radiation greater than 5 pCi/L. Radium 226/228 above the MCL ranged from 5.7 pCi/L to 29.6 pCi/L.

Table 1 summarizes these results.

Of the approximately 145 wells tested, several exceeded a secondary, non-health-based drinking water standard. Secondary standards address quality (taste, color, smell) of water but are not health-based. This means that secondary contaminants are more likely to make water undrinkable before they will cause an adverse health effect. The secondary standards above a Florida DEP MCL include aluminum, iron and manganese. Since these contaminants are not health-based, they were not included in exposure dose calculations in this health consultation. In addition, just because someone drinks water with a primary drinking water standard is above the Florida DEP maximum contaminant level (MCL) does not necessarily mean an illness will occur.

Table 1: Contaminants in Private Drinking Water Wells Above a Health-Based MCL or HAL

Analyte	Lowest value in range above MCL/HAL	Highest value in range above MCL/HAL	# Wells above MCL or HAL/total # wells tested
Arsenic	10.8	49.7	12/145
Boron	730	17000	11/145
Cadmium	6.5	7.2	2/145
Lead	22	23	2/145
Sodium	200000	250000	3/145
Thallium	5.9	5.9	1/145
Radium 226/228	5.7	29.6	14/43

Radium 226/228 in picocuries per liter (pCi/L); All other units not specified are micrograms per liter (µg/L)

MCL = Maximum Contaminant Level

HAL = Health Advisory Level

Chemical contaminants in the environment can harm one's health under certain exposure characteristics which include sufficient dose, but only if one contacts those contaminants at a high enough concentration to cause a health effect. Knowing or estimating the frequency with which people could have contact with chemical contaminants is essential to assessing the public health importance of those contaminants.

To decide if people can contact contaminants at or near a site, the Florida DOH looks at human exposure pathways. An exposure pathway has five parts:

1. a source of contaminants;
2. an environmental medium such as, air, water, or soil that can hold or move the contamination;
3. a point at which people come in contact with a contaminated medium, such as in drinking water, or in soil in a garden;
4. an exposure route, such as drinking contaminated water from a well, or eating contaminated soil on homegrown vegetables; and
5. a population who could come in contact with the contaminants.

An exposure pathway is eliminated if at least one of the five parts is missing and will not occur in the future. Exposure pathways not eliminated are either completed or potential. For completed pathways, all five pathway parts must exist and exposure to a contaminant must have occurred, is occurring, or will occur. For potential pathways, at least one of the five parts is missing, but could exist. Also for potential pathways, exposure to a contaminant could have occurred, could be occurring, or could occur in the future.

This health consultation addresses the public health implications of drinking untreated groundwater. Filters might have reduced the amount of metals or radiation exposure by removing or lowering levels of contaminants prior to ingestion. Therefore, the Florida DOH calculated exposure doses assuming residents did not use filters for drinking water. This assures protection by assuming that the maximum concentration of contaminant was ingested, and the maximum dose was factored into the potential expression of adverse health effects.

For arsenic, boron, cadmium, lead, sodium and thallium, Florida DOH used milligrams of contaminant per kilogram of body weight per day (mg/kg/day) to express the daily dose. For radium 226/228, we reported results in picocuries per liter (pCi/L). For levels of expected health effects Florida DOH converted these results into a total microcurie dose (µCi) for comparison to total dose calculations.

To calculate the daily dose of each contaminant, Florida DOH used standard assumptions about body weight, ingestion and inhalation rates, exposure time length, and other factors needed for dose calculation (ATSDR 1992). The calculation of the dose assumed that people are exposed to the maximum concentration measured for each contaminant in each medium (Table 1). The Florida DOH uses the maximum concentration of each contaminant until sufficient data are available to calculate a measure of central tendency (e.g., mean, median, or mode).

To estimate potential exposure from drinking contaminated groundwater, the Florida DOH made the following assumptions:

- children between the ages of 1 and 6 ingest an average of 1 liter of water per day,
- adults ingest an average of 2 liters of water per day,
- children weigh an average of 15 kilograms (kg),
- adults weigh an average of 70 kg, and
- children and adults ingest contaminated groundwater at the maximum concentration measured for each contaminant for 30 years (a worst-case default assumption used because some residents have lived in the area longer than 30 years, and some have not).

To assist in the evaluation of potential health effects, ATSDR has developed Minimal Risk Levels (MRLs) for contaminants commonly found at hazardous waste sites. A MRL is an estimate of daily human exposure to a contaminant below which non-cancerous, adverse health effects are unlikely to occur. ATSDR might develop MRLs for each route of exposure, such as ingestion and inhalation. ATSDR also develops MRLs for the length of exposure, such as acute (less than 14 days), intermediate (15–364 days), and chronic (equal to or greater than 365 days). ATSDR includes these MRLs in its toxicological profiles. These chemical-specific profiles provide information on health effects, environmental transport, human exposure, and regulatory status.

Public Health Implications

Arsenic

According to a worst-case exposure scenario (a child remains 15 kg for 30 years and drinks 1 liter of water containing 30 µg/L of arsenic every day for 30 years), the dose calculation applied to the ATSDR Toxicological Profile for arsenic shows an increased theoretical risk for cerebrovascular disease and cerebral infarction (stroke) in a 70-year lifetime. The same worst-case scenario for ingestion of water containing 15 µg/L of arsenic for the same time period and body weight shows a low increased theoretical risk of cancer (ATSDR 2000). However, recent studies show that U.S. populations exposed to arsenic in drinking water at levels less than 50 µg/L do not show an increased risk of bladder cancer (Lamm 2003; Steinmaus 2003). Only 2 out of 145 area wells had arsenic above 30 µg/L and only 5 out of 145 area wells had arsenic above 15 µg/L. Therefore, it is unlikely that arsenic detected in area drinking water wells is the cause of widespread illness in the community. Also, realistic exposure scenarios do not generate an exposure dose large enough to the represent an imminent health threat.

Boron, Lead, Sodium and Thallium

Worst-case exposure scenarios (exposure to 1 liter of water for children and 2 liters of water for adults every day for 30 years at the maximum levels measured) for boron, lead, sodium and thallium did not show an increased theoretical risk for non-cancer health effects. Because MCLs and HALs include large safety factors, drinking water with levels slightly exceeding these standards is not likely to cause illness. Boron, lead, sodium and thallium are not known or suspected carcinogens (i.e., are not cancer-causing) (ATSDR 1992; 1999b; 1992a).

Cadmium and Radium 226/228

Worst-case exposure scenarios (exposure to 1 liter of water for children and 2 liters of water for adults every day for 30 years at the maximum levels measured) for cadmium and radium 226/228 did not show an increased theoretical risk for cancer or non-cancer health effects (ATSDR 1990, 1999a).

Child Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; this means they breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus, adults need as much information as possible to make informed decisions regarding their children's health. (ATSDR 1999c).

Conclusions

For current drinking water exposures, the ATSDR categorizes the risk to public health as **a no apparent public health hazard**. Contaminants found in drinking water above primary drinking water standards are not at levels expected to cause widespread illness in the community. Realistic exposure scenarios for arsenic in drinking water do not generate an exposure dose large enough to the represent an imminent health threat.

Local government agencies have implemented prudent public health measures to minimize exposures to continued consumption of drinking water for affected residents. Residents whose well water contains concentrations of arsenic above the pending MCL of 10 µg/L are currently drinking bottled water.

In the past, exposures are suspected to have occurred but contaminant levels are not known. Therefore, for past exposures, the ATSDR categorizes drinking water from private wells as an indeterminate public health hazard. However, based on the absence of current widespread drinking water contamination in the area south and east of Coronet Industries, it is unlikely that the population was exposed to contaminants at high enough levels and for long enough periods to cause widespread illness.

Based on well water samples collected between August and December 2003, levels of arsenic, boron, cadmium, lead, sodium, thallium and radium 226/228 measured in groundwater are not

likely to cause illness. Future exposures to low levels of contaminants in area drinking water (groundwater) sources are categorized as a no apparent public health hazard.

Recommendations

- Resample those wells with levels less than the MCL but greater than ½ the MCL. Analyze for metals, volatile organic compounds, primary/secondary metals, boron, fluoride, gross alpha and other potential contaminants identified as necessary to protect the public health of the communities.

Public Health Action Plan

1. In February 2004, the Florida DOH will coordinate the collection and analysis of fish from ponds on the Gregg Enterprises property near the Coronet site.
2. In March 2004, the Florida DOH will report on its analysis of area cancer rates using data in the Florida Cancer Data System.
3. In the spring or summer of 2004, the Florida DOH will report its findings on the assessment of soil samples collected from the communities surrounding Coronet.
4. In the summer or fall of 2004, the Florida DOH will report on the overall assessment of the public health threat in the area around the Coronet site.
5. The Florida DOH will continue to assist the state regulatory agencies in the evaluation of data.
6. The Florida DOH will continue to inform and educate the public about the findings.

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CERTIFICATION

The Coronet Industries Public Health Consultation was prepared by the Florida Department of Health, Bureau of Community Environmental Health, under a cooperative agreement with the Agency for Toxic Substances and Disease Registry. It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

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ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation, and concurs with its findings.

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Roberta Erlwein
Team Leader,
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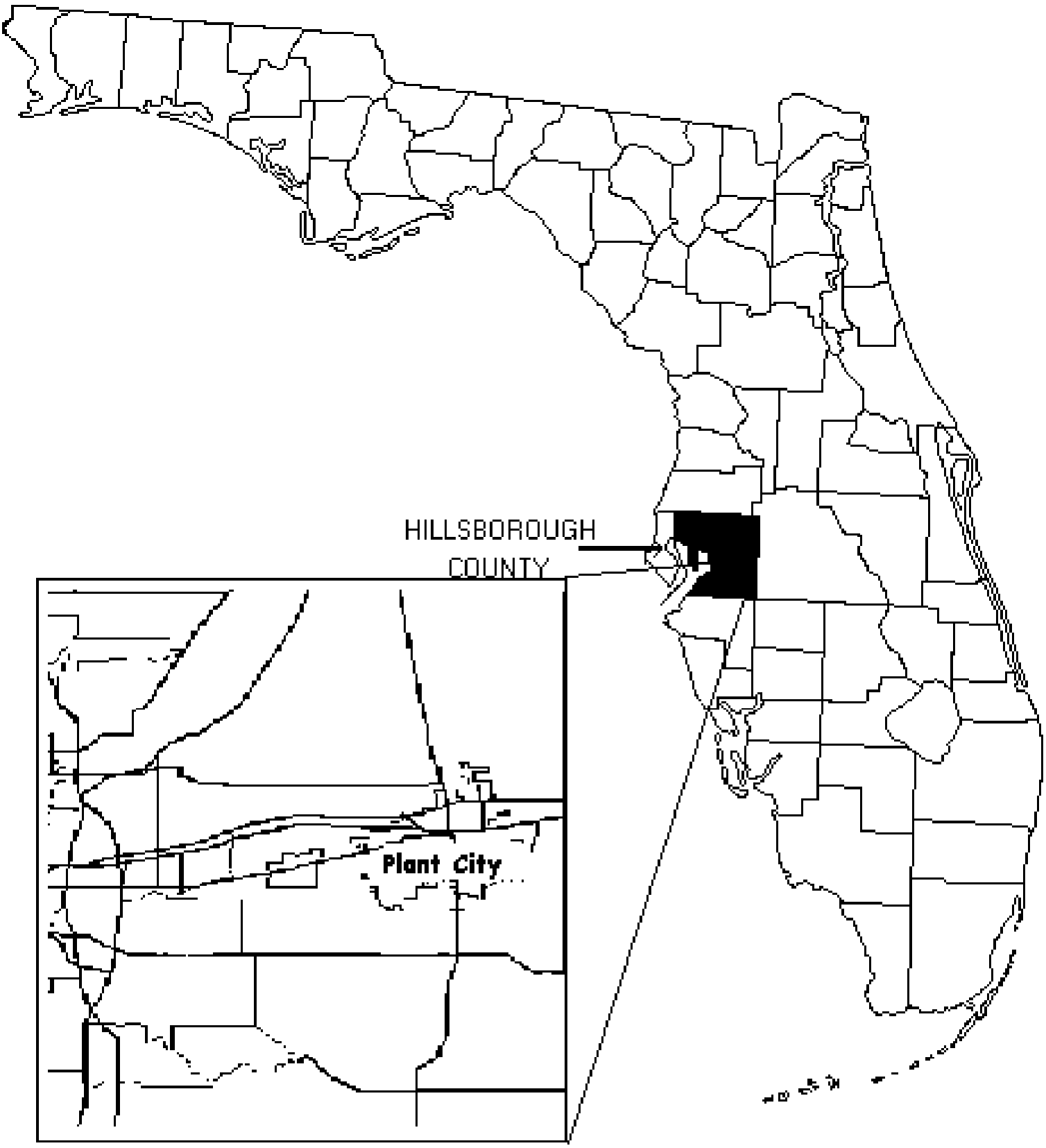
Figures

Map of Florida



SOURCE: FLORIDA DOH FILES **Figure 2: Plant City in Hillsborough County, FL**

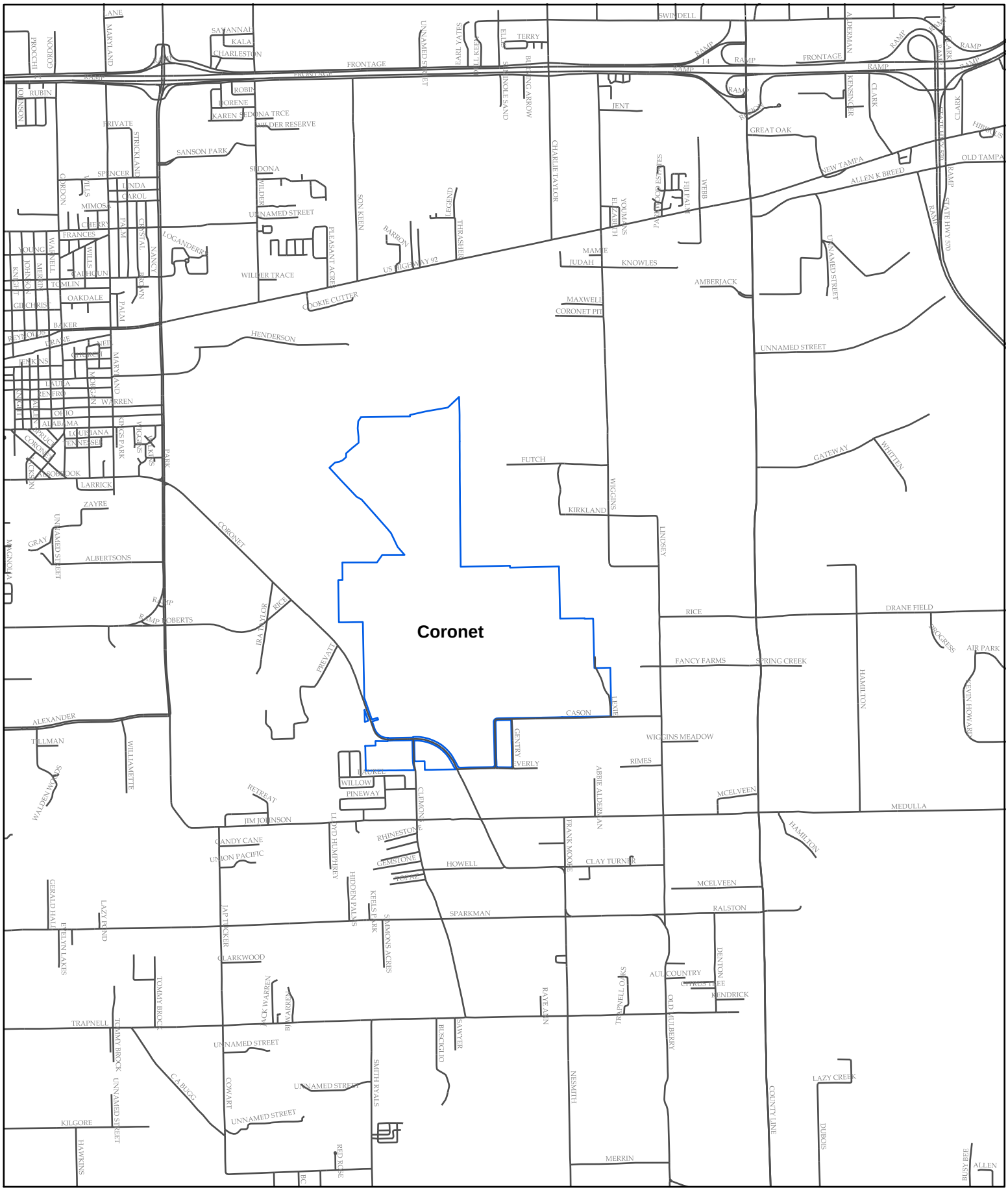


Figure 1
Coronet Site Map

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