ARCADIAN
FERTILIZER, L.P.

Satisfying customer needs with quality products and services

April 25, 1996

Regulatory Reinvention Pilot Projects,
FRL-5179-9, Water Docket, Mail Code 4101, US EPA, 401
M. Street, S.W.
Washington, DC, 20460

Gentlemen:

Enclosed please find our proposal for "Reuse of Phosphogypsum and Organic Waste As A Soil Enhancer" dated April 2, 1996 for submittal under Project XL.

This proposal is the culmination of over 4 years of research work and development in trying to mitigate the environmental impact caused by the production of phosphoric acid and subsequent storage of phosphogypsum, a by-product. It began with an effort using soil, gypsum, and municipal bio-solids to cover our gyp stacks to minimize the rain water leachate generated from open gyp stacks and subsequently pumped to the Mississippi River. The minute quantities of phosphoric acid that enter the river from four phosphoric acid plants in Louisiana are enough to cause the state to be designated the number one polluter" (water) in the United States.

In 1992, 40 CFR Part 61.204 was promulgated and authorized the use of phosphogypsum (gyp) to be removed from stacks for use in agriculture and for other uses specifically approved by EPA. Based on a risk assessment commissioned by EPA, however, it was determined that the radioactivity of the phosphogypsum should not exceed 10 pCi/g for unrestricted use in agriculture. Although there are some areas in the United States that have gyp that meets this criteria, most do not. It was estimated in 1984 that over 7.7 billion tons were stored in stacks primarily in 4 states. The radiation of gyp stored in these stacks varies from 14 to 37 pCi/g.

The radioactivity level of the product being proposed is less than 10 pCi/g and would appear to meet the requirements of the current regulation, 40 CFR. However; regulation indicates, that once gyp has been placed in a stack, it cannot be taken out if radiation (Ra 226) exceeds 10 pCi/g. This would appear to be an excellent example of the purpose for which the XL Program was created to accomplish: "...flexibility to develop alternative strategies that will replace or modify regulatory requirements on the condition that they produce greater environmental benefits."

Not only does the proposed project offer a beneficial use for phosphogypsum, but by combining compost with the gyp, the product serves to reduce the need for additional chemical fertilizer and makes the use of available nitrogen more efficient.

Also, the direct benefit offered by this project, would serve to increase the market for compost which is currently being touted as an excellent recycling method for all kinds of organic waste turning potential environmental pollutants into environmental safe and beneficial products.

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Although composting has long been recognized as an answer to the problem of solid waste disposal and to the growing shortage of land fill areas, most municipalities supplement composting projects by charging tipping fees for disposal. A broader market for compost could reduce these charges and provide a subsequent savings to tax payers.

Arcadian has been developing the product associated with this project for several years. Phosphogypsum stacks have been covered with dirt and mixed with municipal bio-solids from the city of Baton Rouge in a continuing program to seal off the gyp stacks from falling rain creating leachate which is ultimately pumped to the Mississippi River via long standing DEQ and EPA permits. During this period Arcadian has worked with several local citizens groups in the area as well as the local university and feel we have their support. This effort will be continued and their support documented in further planned meetings and contacts.

In working with Louisiana DEQ and EPA, Region 6 officials, we were informed this proposal would be a good candidate for submittal under the "XL" program and encouraged to do so. We wish to express our thanks to the EPA officials in Dallas, TX, Region 6, and Louisiana State DEQ officials who have assisted us by encouragement and answering our many questions.

Your approval of the proposed project will allow Arcadian to generate a most beneficial and useful product both to the farming community and the environment in general. Should you have any questions or need further information please contact Mr. Dave Basu, Fax no. (504) 751-9337.

Respectfully submitted,

Ahmad Hujbre

Plant Manager

Enclosures: "Proposal For Reuse of Phosphogypsum And Organic Waste As A Soil Enhancer".

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PROPOSAL FOR

REUSE OF PHOSPHOGYPSUM

AND ORGANIC WASTE

AS A SOIL ENHANCER

SUBMITTED UNDER THE EPA PROJECT XL PROGRAM

FOR:

ARCADIAN FERTILIZER, L.P.
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April 24, 1996

PROPOSAL FOR THE REUSE OF

PHOSPHOGYPSUM AND ORGANIC WASTE

AS A SOIL ENHANCER

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PROPOSAL FOR THE

REUSE OF PHOSPHOGYPSUM

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1.0 INTRODUCTION

This proposal is being made by Arcadian Fertilizer, L.P., in conjunction with D & S, L.L.P (owner of the patent pending process). The primary objective of this proposal is to provide for the economic and beneficial use of phosphogypsum and certain agricultural wastes by recycling them into safe and nutrient rich products for agricultural and horticultural purposes in place of the current practice of stockpiling. In specific, this proposal seeks the approval of EPA via the XL Project program for the removal of phosphogypsum from certain stockpiles for the use in a compost blending process creating a new and beneficial product that decreases the radioactive concentration in the final product to less that 10 pCi/g and, further, that said product be approved as equivalent to that phosphogypsum referenced in Part 61.204 in Federal Regulation 40CFR for distribution in commerce for agricultural purposes.

1.1 HIGHLIGHTS OF BENEFITS

1.1.1 Environmental Benefits:

- This proposal is for a solid waste recycling project where-in the re-use of the phosphogypsum is more beneficial to the environment than stockpiling.

- It will reduce or eliminate the rainwater/wash water runoff from the stockpiled phosphogypsum.

- It will reduce the need for agricultural waste and animal waste stockpiling causing surface runoff pollution, which is a contributing factor in the disruption of such delicate eco-systems as the Florida Everglades and the Atchafalaya Basin in Louisiana.

- As a soil enhancer, it will reduce the need for additional chemical fertilizers, thus reducing the pollution caused by runoff from agricultural fields, also a contributing factor in the disruption of delicate eco-systems.

- Reduce need for land fill areas, which are currently in severe shortage, for the disposal of certain agricultural and "green" yard wastes by recycling these wastes in a composting process.

- The proposed soil amendment enhances clay soil types, especially those that are similar to the basin soils of Louisiana by improving aeration and drainabity.

1.1.1 Environmental Benifits cont:

- Sulfur and calcium in the phosphogypsum that is now being wasted in stockpiles, will subsequently be utilized as a plant nutrient.

- The use of the phosphogypsum accelerates the decomposition of "difficult" agricultural wastes including animal and municipal solid wastes (MSW).

1.1.2 Economic Benefits:

- Reduce costs for Louisiana farmers by providing a low cost, high quality soil enhancer that will increase crop yield and improve soil in the long term.

- Providing a economic source of plant nutrients from waste products.

- Reduce the cost for the storage and disposal of phosphogypsum.

- Utilize municipal sludge in the composting process, thus reducing costs for local municipalities due to the disposal or land filling of such waste.

- The proposed product could help to reduce trade imbalance by allowing export of the soil enhancer to the countries that are supplying the phosphate rock.

1.2 PROCESS AND PRODUCT DESCRIPTION

1.2.1 Application:

The proposed product amplifies upon the use of compost as a soil enhancer by the addition of the calcium and sulphur in the phosphogypsum, and through its drainage enhancing properties. The proposed soil enhancer can be used in a wide variety of agricultural and horticultural applications, including but not limited to food and fiber crops, landscaping and ornamental gardens, lawns, and golf courses.

It will renew soil productivity by the addition of humus in the compost, reduce the need for irrigation water requirements, and also enhance aeration and drainage properties of the soil. The addition of the organic matter to the phosphogypsum and mixed into the soil, enhances its ability to transfer nutrients to the plant by binding with the nutrients in the soil and making them available to the plant systems slowly, as required by the plant, thus reducing need of chemical fertilizers.

1.2.2 Process:

When the granular phosphogypsum is added into the composting operation under this process with the necessary pH regulating agent, a chemical reaction takes place. The calcium aluminum ferric phosphate in the phosphogypsum binds with the inherent moisture of the compost, reacts and produces a gelatinous, flocculating substance. This reaction takes place as the pH of the mixture increases. When the pH reaches the level of 1, Calcium Sulfate is produced, as the level of the pH rises from 1 to 3, Calcium Phosphate, Aluminum Phosphate, Ferric Phosphate, and Magnesium Phosphate is also formed, and finally when the pH is increased to between 3 and 7, Calcium hydro-phosphate is also produced. All of these ensuing chemical compounds are gelatinous substances that hold moisture which cling to composted particle surfaces. This gelatinous substance insures a

1.2.2 Process cont:
consistent blend of ingredients by preventing the phosphogypsum from separating and collecting and uniquely aids in the retention of moisture. * (see Attachment 1 for Process Flow Diagram).

This reaction continues and is enhanced in the field, as when further moisture is added to the soil and soil-enhancer, the moisture is collected and stored within the gelatinous formations. This gelatinous matter attaches itself to the roots of plants, thus facilitating the absorption of the nutrients available in the compost and phosphogypsum. This is in addition to the ability of the gypsum to aerate the soil and allow the soil to release excessive moisture, thus permitting healthier root formation and plant growth.

1.2.3 Product:
An initial study was conducted and the results were analyzed. A typical product sample using composted bagasse and phosphogypsum as the primary ingredients was tested by the Louisiana Department of Agriculture. The results were as follows: Nitrogen-0.58%, Phosphorus-3.3%, Sulphur-8.53%, Potash-1.1%, Ca-14.0%, Zn-112 ppm, Al-.990%, Na-.067 ppm, Mg-.38%, Cu-38 ppm, Fe-.60%, pH-7.2, Moisture-15.78%, Sieve Test- No. 10: 96.83%, No. 60: 75.08%, No. 100: 53.14%, Barium-63.8 ppm, Cadmium-1.92 ppm, Arsenic-0.74 ppm, Selenium-0.27 ppm, Lead-<4.0 ppm, Mercury-$<.1$ ppm. A typical sample was also tested for radioactivity by Radiation Technology Services. The results were as follows: Ra-226 (pCi/g)-2.43 ± 0.36, Ra-228 (pCi/g)-<0.56, K-40 (pCi/g) 7.00 ± 0.19.

2. ENVIRONMENTAL RESULTS

2.1 AN ALTERNATIVE TO STOCKPILING

2.1.1 Background:
The disposal of waste products, in general, is an ever increasing nationwide concern. Public demand and government regulations have called for safer and more effective storage and disposal of these wastes. Most production processes, including agricultural, industrial, and municipal water treatment produce waste by-products. The proposed process affords for the economic and environmentally safe disposition of such waste products.

2.1.2 Agricultural Waste Stockpiling:
Southern Louisiana is a leader in the production of sugarcane, rice and other crops, creating considerable quantities of agricultural by-products. The prevailing method of disposal is stockpiling. Many of these stockpiles are unmanaged, and represent a source of surface water pollution. There are proposed changes that may affect regulations concerning the storage and disposal of these agricultural wastes. It is in the interest of the State to explore new developments that may assist them in the implementation of the environmental regulations while keeping the costs to the producers to a minimum. Parties within the Louisiana Agriculture Department have expressed a serious interest in this process.

2.1.3 Stockpiling of Phosphogypsum:
According to EPA Background information Document 402-R-92-002, there were 63 phosphogypsum stacks nationwide in 1989. These stacks were located in 12 different states, with two-thirds located in just four states: Florida, Texas, Illinois and Louisiana. The total phosphate waste generated in the U.S. is estimated at 7.7 billion MT and has grown at over 40 million MT per year since 1984.

2.1.3 Stockpiling of Phosphogypsum cont:
Phosphogypsym, commonly known as gypsum or gyp is produced in the United States as a by-product of the manufacture of phosphoric acid by the reaction of sulfuric acid with a calcium phosphate sandy rock. Phosphoric acid, in the form of phosphates, is widely used throughout the U.S. as a vital nutrient in agriculture, including animal husbandry. It is also used in many consumer products such as soft drinks, detergents, and other edible goods. Phosphorous is essential for all forms of life. It is this quality that may cause environmental problems. Unrestricted run-off or drainage of water containing phosphoric acid into the public water streams may cause eutrophication under certain conditions. This has led the EPA to designate phosphoric acid as a controllable product subject to federal regulation. The Florida Institute of Phosphogypsum (FIPR) and The Fertilizer Institute (TFI) are vigorously pursuing other uses of phosphogypsum in recongnition of the growing problem of stockpiling.

2.1.4 Current Phosphogypsum Regulations:
These regulations, in part, require the storage of gypsum, which may contain residues of phosphoric acid of up to 2%. The gypsum is stored in large stacks so constructed as to protect the surrounding land and water systems. Not only are the gyp stacks unsightly and present a possible environmental problem, they require long term expenditures for maintenance and monitoring. Although cost estimates vary widely depending on the size of the stack and other variables, an average closure cost of $10 million per stack is realistic.*[1]

The calcium phosphate used in most "wet acid" processes contains traces of naturally occurring Uranium 226. This has led the EPA to issue regulations, found in CFR 40 Part 61, which prohibit the removal of gypsum from the stacks which have a radioactivity level greater than 10 pC1/g. Because the vast majority of all gyp stacks resulting from the manufacture of phosphoric acid has a radioactivity greater than 10 pCi/g, the stockpiling of vast quantities of gyp continues to grow. There are more than 27 stacks in Florida containing 600-700 million metric tons. These stacks are being added to at the rate of 30 million tons per year.*[2]

At the Geismer, Louisiana, Arcadian plant alone, which is a relatively small producer, the gyp stacks cover over 250 acres and contain over 96 million tons of gyp. Excess rainwater which falls on the stacks, absorbing various amounts of phosphoric acid, is pumped to the Mississippi River under State DEQ and Federal EPA permits. The phosphoric acid from rainwater discharged into the river from just four of Louisiana phosphate manufacturers is enough to rate Louisiana as one of the top polluters in the U.S. The product which results from this proposed patent pending process combines gypsum with compost, and contains an average radioactivity of 6 to 8 pCi/g. Agricultural use of the product as a nutrient or as a soil amendment will result generally in undetectable additional radioactivity.*[3] That is, the natural radioactivity of most soils used in agriculture would mask the amounts of radioactivity being added.

2.1.5 Environmental Benefits Resulting from the Reduction of Stockpiling Phosphogypsum:
Stock piles of phosphogypsum with excess radioactivity will be reduced. The potential contamination of groundwater from leachate will be reduced. Smaller stacks will lessen the potential impact of levees or dams bursting or overflowing with resultant major discharges of contaminated water flowing into local streams and wetlands. The pumping of excess run-off rainwater from stacks to the Mississippi River will be greatly decreased or totally eliminated.

2.1.6 Environmental Benefits From Re-use of Agricultural Wastes:

The product, which uses approximately 50% compost, gives further enhancement to its environmental performance. The composting process, which utilizes almost any biodegradable waste product, has been well documented over the years as to its environmental benefits and has spawned a growing industry .*[4]

However, due to the heavy transportation costs involved in the collection of wastes and the shipment of product in the composting process, successful commercialization still depends to a great extent on tipping fees for the disposal of waste. The availability of huge supplies of gyp in a single location and at relatively low cost only enhances the viability of composting. In Louisiana, as elsewhere across the US, the need for landfill sites is rapidly exceeding the availability. "MSW generation reported by States rose to 323 million tons in 1994, up from 307 million tons in 1993. The number of landfills accepting MSW continues to plunge - there are 3,558 down from 4,482 in 1993."*[5]

As a result, agricultural wastes such as bagasse from cane, cotton hulls and rice hulls continue to look for other economic solutions which composting accomplishes only if the marketability of the product pays the bills.

2.2 ENVIRONMENTAL BENEFITS TO THE SOIL AND AGRICULTURAL

2.2.1 Available Nitrogen is Used More Completely By the Plant:

A vital benefit of the gyp/compost product arises from the ability of the gelatinous property of the product to bind the available nitrogen until it can be used by the plant. The present method of supplying nitrogen to the soils allows a high percentage to be evaporated, and another portion to be washed from the soil by rain. The pollution caused by nitrogen run-off has led EPA to limit the amount of nitrogen fertilizer that can be applied by the farming community. Not only does the product furnish additional nitrogen but causes the nitrogen supplied as fertilizer to be used more efficiently. "Compost slowly and continuously releases nutrients over time, which is compatible with plant uptake, and reduces fertilizer requirements by about 50 percent."*[6]

Not only is this a more efficient use of fertilizer, it allows less nitrate to be carried off by rainwater into nearby streams or to leach into aquifers.

2.2.2 Water Conservation and Soil Conservation:

The proposed product can make poor, overworked soils, sandy soils, and heavy clay soils usable and productive. The humus or organic material is useful to all soils. Because the humus absorbs water like a sponge, less water evaporates from the fields, so less water needs to be used for irrigation.

In places like Louisiana, where there is heavy clay soils, the product improves aeration and drainage. In desert areas, the product can be added to sandy soil that has been over cultivated or that may seem unusable. It will make the sandy soils usable for farm crops with less water.
Also, because the product has natural abilities to fight off weeds, insects and plant deceases, less chemical herbicides and pesticides may be used. This is very important to protect the water supply, as pesticide and herbicide runoff from farm fields has been a dangerous and costly problem in the United States.

3.0 COST SAVINGS AND PAPERWORK REDUCTION

3.1. ECONOMIC BENEFITS CAUSED BY THE REDUCTION OF STOCKPILING PHOSPHOGYPSUM

The cost to build new stacking areas for the continuing production of gypsum will be reduced. A proposal in 1993 to construct a 116 acre stacking area at the Geismar, LA was estimated to cost $5.8 million. Closure costs of $10 million per stack will continue but the number of stacks will not increase at the same rate as in the past. The permitting of gyp stacks requires the installation of monitoring wells, regular reports, and outside engineering consultants to continually monitor the stability of the stacks. Companies must provide bonds or escrow funds for the monitoring and upkeep of gyp stacks up to 50 years after closure. Approval of this project and the successful marketing of the product will not be immediate but will have a long term and significant impact on reducing the cost to operate gyp stacks and associated paperwork.

3.2 ECONOMIC BENEFIT TO FARMERS

Farmers will benefit economically several ways from use of this product. The need for additional plant nutrients including nitrogen will be reduced. A low cost source of calcium and sulfur, currently considered a waste, will be provided. Costs for mitigating the pollution from stockpiling agriculture and animal waste will be reduced by incorporation of those wastes into a useful product.

4.0 STAKEHOLDER SUPPORT

Arcadian and D & S, L.L.P. have pursued this and other innovative projects to reduce pollution at their Geismar location for over four years. Arcadian was the first in the nation to utilize municipal sludge to cover the stacks to improve the aesthetics and improve the environmental performance of the stacks. Not only is the Mayor of Baton Rouge, Mr. Tom Ed McHugh extremely pleased at the cost reduction to the city due to the utilization of the sludge as opposed to landfilling the sludge, but people in the Geismer area also seem to be pleased. New neighborhoods ($150,000 to $200,000 homes) have sprung up within a one mile radius of the stacks at a rapid rate. This is especially notable, as several years ago, this was not considered a desirable location for building homes.

Louisiana State University Agriculture Services has encouraged the pursuit of this project by recognizing the economic and environmental benefits of the soil enhancer, based on their extensive research of the use of compost and the use of gypsum for agricultural purposes in Louisiana. Prior to the change in regulations that prevented the removal of phosphogypsum from storage for field research, Louisiana State University Agronomy Department, had performed fifteen years of extensive field testing of phosphogypsum which also involved the local agricultural community.
We have consulted other premier universities such as, Auburn University and Texas A & M, and have received the same encouraging support for the proposed product.
We have also met with sugar cane producers and other agricultural concerns in the region. All have recognized the benefits of the proposed product. Louisiana farmers and other regional farmers will be greatly benefited by having made available to them an inexpensive source of vital nutrients, humus, and aeritablty agents to help make their land more productive and profitable.

All of the above support and encouragement must be viewed in the light that, under current regulations, field tests have not been conducted. Yet, in the case of the sugar cane farmers, there has been a request for more information, samples, price and availability.

4.0 STAKEHOLDER SUPPORT Cont:

Unfortunately, this can not be achieved until we have approval to begin the project. As there are patents pending on this process, we have been under certain understandable constraints. It is intended that this proposed project be brought to the forefront of, not only the phosphogypsum industry, but also to the public and concerned groups, through the publication of research papers in notable journals, neighborhood meetings, local media press releases, and seminars with local agricultural organizations.

5.0 INNOVATION/MULTI-MEDIA POLLUTION

The gyp/compost project is a multi-media process within itself. First of all it provides a new and useful product through the nutrients it contains. Its adds through its soil amendment capability improved aggregation, water filtration and retention, nutrient content and buffering capacity, and soil bio activity. *[7]

Gypsum has been used to reclaim salinized farmland in the United States and recently in an area located in the Jeseel valley, in the northern part of Israel. The calcium in gyp replaced the sodium in the soil reducing the over-all salinity making the land useful for farming.*[8]

The proposed process provides for the useful application of large quantities of a waste product which have been accumulating in stacks throughout the United States. It increases the need for huge amounts of compost which is the most efficient and safe method now available for solid waste reclamation. Composting reduces the need of large land areas for landfill by reducing the bulk of solid wastes up to 90% and "avoids subsequent production and leachate formation in landfills. Compost has been found to bind heavy metals which are then no longer bio-available to man or animals and cannot migrate to water resources or be taken up by plants."*[9]

It has only recently (1995) been found by Dr. Francis Gouin at the University of Maryland that the rate of compost formation in mixed organic MSW was dependent upon the carbon/phosphorous ratio. An increase in phosphorous resulted in a faster composting rate and improved cost effectiveness.*[10]

This gives added impetus to the use of phosphogypsum for "composting" animal wastes which is becoming an increasing environmental concern. It has just been reported at a TFI sub-committee meeting held in Tampa February 26, 1996 on uses for gyp, that TFI had just received a request from the Washington-EPA to do a study on the use of animal wastes in phosphogypsum. The gyp/compost product increases crop yields*[11], lessens the need of nitrogen fertilizers and subsequent potential for nitrate pollution. It is simple to manufacture, safe to use and non-polluting.

6.0 TRANSFERABILITY

The patent pending process is simple and can be used by composters or industrial waste recycles requiring only economic accessibility to raw products and markets. Being primarily an agricultural product, it readily complements the production and marketing of phosphates as fertilizer. As a soil enhancer, it has the potential of expanding the compost product market as a supplemental ingredient. Whether or not a compost/gyp product is an economic viablilty depends upon the relative distance between market, compost and gypsum since transportation is a major cost factor. However, the potential remains for the reduction of environments risks at each site where gyp is stored for minimizing rainwater run-off and subsequent disposal to rivers.

7.0 FEASIBILITY

Production and marketing of a gyp/compost product is both technically and administratively feasible for Arcadian Fertilizer, L. P. The plant is ideally located at Geismar, LA in a rural community on the Mississippi River. The plant has quick access to Interstate Highways, railroads, and barging facilities. It is located between two large cities and near large sugar cane farms which supply both the raw materials and market. Arcadian's major market is to the agriculture sector. Should the project show an acceptable market both on return of capital and an acceptance of the product, Arcadian has the ability to make the project into a successful commercial venture.

7.1 DESCRIPTION OF SITE

The preferred site would be 15 to 20 acres within the EPA approved gyp stack area, expandable to meet future requirements, accessible to water and electrical services at the Arcadian site, Geismar, Louisiana. The site will be leveled on a 3% grade north and south, filled with paving stone, and compacted. Ditches around the site will be provided to collect leachate drainage to a central sump. Compost, including compost in process, is highly absorbent, so very little leachate drainage will occur. Sump liquor will be sprayed back on the windrows to assist maintaining the 50% moisture level needed for composting.

8.0 MONITORING, REPORTING AND EVALUATION

Arcadian is a major corporation with multiple plants throughout the US. It applies for and maintains permits from local, state and federal agencies for which it is held accountable for monitoring, controlling, and reporting. If Arcadian's application for this project through the XL program is successful, it must still have State and local agencies approve the use and marketing of the product. In order to monitor the effectiveness as well as the safe application of compost gyp product, Arcadian will engage Louisiana State University Agriculture Department to conduct follow-up surveys of selected farmers who have used the product at 3, 5, and 10 year intervals and make the reports available to EPA.

8.1 QUALITY CONTROL PROCEDURES

Quality assurance and quality control will be monitored by Growth Environmental Services and Louisiana State University Labs, or other approved laboratories, in accordance with industry standards and regulations. An analysis will be performed on the final soil enhancer product, and test results will be kept on file at Arcadian. The analysis will indicate the following: Nitrogen, Potash, Calcium, Zinc, Aluminum, Sodium, Phosphorus, Sulphur, Magnesium, Copper, Iron, Barium, Cadmium, Arsenic, Selenium, Lead, Mercury, pH, moisture, Sieve Test(#10, #60, #100). The radioactivity of the phosphogypsum and the soil enhancer will be monitored and tested by Growth Environmental services before any product is shipped, at a consistent frequency, and to insure that the radioactivity is uniform throughout the tested medium and, further, to insure that radioactivity is within safe and acceptable limits as detailed in 40CFR, Part 61.204 and Part 61.207. All tests are to be performed using EPA approved procedures.

9.0 SHIFTING OF RISK BURDEN

There is no added risk burden in the manufacture of this project. The risk factor attributed to radioactivity less than 10 pCi/g for phosphogypsum applied as a conventional soil enhancer in

9.0 SHIFTING OF RISK BURDEN Cont:

agriculture at normal recommended rates has been recognized by EPA in 40 CFR as acceptable. The product has been tested for heavy metals and conforms to all known local and federal regulations.*[12]

In his paper presented to Florida Institute of Phosphate Research, Dr. Malcolm E. Summer concluded: "Application of a phosphogypsum with a high 226 RA content (35 pCi/g) at the maximum rates for the different uses... would result in a maximum cumulated 226Ra concentration of 1.57 nCi/kg of soil which is much lower than the 5 nCi/kg considered to be the upper limit of a safe range. Where phosphogypsum has been used as a source of Ca or S for crops, radiation added to the soil has, in all cases, not significantly increased native background levels."*[13]

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