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*Florida Institute of Phosphate Research*



**2003-2008**

**Strategic Plan**

**September 2003**

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# **Florida Institute of Phosphate Research (FIPR)**

## **Overview**

### **Introduction**

The Florida Legislature created the Florida Institute of Phosphate Research (FIPR) in 1978 to initiate, conduct or sponsor studies on the environmental and health effects of phosphate mining and processing and to determine better methods to improve the economy, the environment and the welfare of Florida's citizens, including their health and safety.

FIPR is an independent state research organization with a mission to conduct, or cause to be conducted, studies that would improve phosphate industry efficiency, reduce its use of water and energy resources, and enhance efforts to reclaim the land that mining and processing affects. FIPR also is obligated to educate and inform Florida citizens about the industry, its effects, and FIPR's research findings as well as general scientific knowledge concerning the industry.

Florida's Governor appoints members of the Board of Directors that govern the Institute. The Board must include one state university system faculty member, one major state conservation group member, one State Government employee (customarily from the Florida Department of Environmental Protection), and two phosphate industry members. Board members serve three-year terms, and may be reappointed.

The Board determines FIPR's policies and priorities. Environmentalists, public officials, regulators, phosphate industry representatives, and the general public help the Board determine FIPR's research priorities. The Board also determines which research projects to fund with the assistance of outside experts, standing technical advisory committees, FIPR Staff, and the public.

### **Research**

FIPR usually categorizes its research into several work areas:

- Chemical processing
- Mining and beneficiation
- Environment and reclamation
- Public health

Research projects, however, often pertain to more than one of FIPR's research areas because they have components that fit under more than one heading. For example, research on phosphogypsum, a by-product of phosphate fertilizer production, may include chemical processing of the phosphate, production and treatment of the process water, use of the by-product, and reclamation of a closed phosphogypsum stack.

## **Public Information**

FIPR conducts seminars, conferences, and workshops on subjects pertaining to its research program. Research projects result in peer-reviewed documents which are available in hard copy and in electronic format. Scientists and engineers working for FIPR are encouraged to present their findings in peer-reviewed journals and at scientific conferences.

FIPR works with the media to ensure the accuracy of stories about the industry and its impacts. FIPR's library is considered the finest collection in the world of information about the phosphate industry. The library is open to the public and has the ability to access technical references through extensive on-line resources and through the Internet. A description of the library services and its collection can be found on the FIPR home page at <http://www.fipr.state.fl.us>.

## **Education**

The Institute has an education program to assist teachers in achieving the Sunshine State standards using information concerning phosphate industry operations and issues. To achieve this objective, FIPR uses its scientific, environmental and technical expertise and information in teacher training workshops and in development of lesson plans, curricula and materials for use by teachers.

## **Staff**

FIPR has a dedicated staff of professionals, including chemists, biologists, engineers, librarians, a public information specialist, education coordinator, research assistants, and administrative personnel. The Institute has approximately 25 full- and part-time employees.

## **Facilities**

The Institute is located on the western edge of Bartow, Florida -- Polk County's seat and the heart of the phosphate mining district. FIPR occupies eight acres of land that once was mined and has been reclaimed. The campus contains four buildings, housing administrative offices, the library, a biological laboratory and greenhouse, a metallurgical and analytical chemistry laboratory, and a Teacher Education Center.

## **Agency Strategic Plan**

Under the provisions of Chapter 186, Section 186.022(1), Florida Statutes, the purpose of the Agency Strategic Plan (ASP) is to identify the strategic priority directions an agency will take to fulfill its mission within the context of the State Constitution, the State Comprehensive Plan (SCP), Florida Statutes, and other statutory mandates or authorizations. The plan must be consistent with, and further, the goals of the SCP. Additionally, each agency strategic plan must identify the specific legislative authority necessary to implement the provisions of the plan.

# *Florida Institute of Phosphate Research*

## **MISSION STATEMENT**

*"The mission of The Florida Institute of Phosphate Research (FIPR) is to maintain a leadership role in identifying, funding, disseminating and assuring the scientific validity of research that will:*

- Result in the assessment and resolution of significant phosphate industry issues affecting the environment and the health and safety of the citizens of Florida*
- Lead to the implementation of new technology that will be of joint benefit to the industry and the citizens of Florida*
- Benefit the economy, environment and welfare of the citizens of Florida."*

**The Institute, a state agency, accomplishes this mission by:**

1. Conducting in-house research and funding research by others.
2. Facilitating the application of research results.
3. Coordinating FIPR activities with local, regional, state and national governmental agencies, and research organizations.
4. Disseminating research results to the industry, government, the research community, and the public.
5. Maintaining an information center on FIPR's research mission areas of environment and technology.
6. Maintaining technical contacts worldwide to assure access to new developments that might be applicable to Florida phosphate concerns.
7. Conducting public information, education and technology transfer programs.
8. Conducting conferences and workshops for all interested and affected parties about the research results and priorities of the Institute.
9. Acting as a liaison among educational institutions, associations, industrial, governmental, and environmental entities.

*Florida Institute of Phosphate Research*

**VALUES STATEMENT**

*We, the Board and Staff of the Florida Institute of Phosphate Research (FIPR), pledge that we will:*

- Act without bias or favoritism in the performance of our duties
- Operate with openness and integrity, and with respect for all laws and regulations
- Perform high-quality, professional work, and insist upon the same from our contractors
- Respect each other and those we serve
- Be receptive to thoughts, ideas, and criticism from the public, the environmental community, the industry, the education community, the Legislature, and regulatory and governmental agencies

# **FIPR'S 2003-2008 STRATEGIC PRIORITIES**

## **Environment**

Environment  
Reclamation  
Public and Environmental Health

## **Technology**

Phosphogypsum and Process Water  
Mining and Rock Processing Efficiency  
Waste Clay Ponds

## **Programs**

Technology Transfer  
Information Services and Library  
Education

Florida State Statute 378.101(4)(a) specifies that the research priorities of the Florida Institute of Phosphate Research (FIPR) will have emphasis on solving real problems of the industry in which the public has a substantial interest. These priorities are reflected in the Institute's Strategic Plan.

FIPR's previous strategic plan covered the period 1998 to 2003. At its April 2003 meeting of the Board of Directors, accomplishments under that plan were reviewed. At its July 2003 Board Meeting, the public was invited to comment on the strategic plan for the period 2003 to 2008.

This strategic plan discusses goals in each of FIPR's research and programmatic areas. For each area, goals are presented. Each goal is accompanied by a discussion of the rationale for pursuing the goal as well as approaches to achieving the goal. In many cases, the goals and approaches are continuations of goals and approaches FIPR has followed in the past. Although substantial progress has been made towards achieving these goals, more work is still needed.

The order in which work areas are discussed and the order in which goals are numbered and discussed is for clarity and convenience. The order of discussion and the order of numbering should not be interpreted as an order of importance or priority.

## **FUNDING FOR FIPR PROGRAMS AND OPERATIONS**

FIPR gets its revenue from the severance tax that the phosphate industry pays. FIPR's allocation from the phosphate severance tax is placed in the Phosphate Research Trust Fund. FIPR draws on the Trust Fund to pay for its programs and operations.

FIPR has seen a huge reduction in its revenue over the past several years. Although it is expected that FIPR's revenue will rise during the next few years, this increase is far from certain. In addition, it is doubtful that FIPR's revenue will return to levels that enable it to fully carry out its mission. Thus, other sources of revenue are needed. Federal and state agencies and private institutions could be a source of some of this revenue. FIPR will work to obtain funding from these sources to supplement its severance tax allocation.

FIPR pays substantial fees from its severance tax allocation. During FY 02/03, the Department of Revenue received \$334,000 and the State General Fund received 7.3% of FIPR's allocation. These fees usually represent 12 to 18% of FIPR's allocation and significantly reduce the funding available for FIPR research and programs.

The fees which FIPR pays can be reduced or eliminated only by action by the State legislature. We will be working with legislators to reduce the fees to a more reasonable level.

In addition, FIPR will seek to supplement its revenue from the severance tax by finding other sources of funding. FIPR will seek funding for specific projects from Federal and state agencies and private institutions that provide grants for research and education.

## **DEVELOPMENT OF FIPR-FUNDED PROJECTS**

Institute-funded projects are directed at solving real-world problems identified with the mining and processing of phosphate rock in Florida in which the public has a substantial interest. Projects originate from one or more of the following sources:

- Unsolicited proposals from the technical community and researchers
- Proposals formally solicited by FIPR Staff from the technical community through requests for proposals.
- Proposals originating from the FIPR Staff and/or its Technical Advisory Committees.
- Proposals from governmental agencies, including FDEP and EPA.

This document is intended to provide guidance for proposal topics of interest for all the above sources.

First and foremost, the Institute and its reviewers attempt to answer the following three questions when evaluating whether proposals should be funded:

- Is the project technically feasible?
- Is the project beneficial, or at least neutral, to the environment and public health?
- Is the project economically practical?

# **RESEARCH PRIORITIES**

## **Environment**

Environment  
Reclamation  
Public and Environmental Health

## **Technology**

Phosphogypsum and Process Water  
Mining and Rock Processing Efficiency  
Waste Clay Ponds

As mentioned previously, FIPR's research programs frequently require contributions from several of its major work areas. Similarly, FIPR's public information and education programs are tightly integrated with each other and with the research program. For example, Technology Transfer stands alone as a program area but is also integral to the public information program.

As a result, there is overlap in both goals and approaches among the various research areas and programmatic areas. To help the reader, cross references are provided for approaches which intersect significantly with approaches in other work areas.

## CHEMICAL PROCESSING

### **Goal 1. Develop procedures for reducing the magnitude of the process water problem.**

Discussion: Process water is essential to the operation of phosphoric acid plants. It is used as make-up water for phosphoric acid manufacture, to convey the phosphogypsum to the stack, to remove the heat generated during phosphoric acid manufacture and to scrub all the exhaust gases within the chemical complex to prevent the discharge of undesirable gases to the atmosphere. In the course of serving all these functions the process water becomes acidic and reaches an equilibrium content of all of the materials found in both the phosphate rock and the sulfuric acid. While the plants are designed to operate with a negative water balance, periods of excessive rainfall may make it necessary to treat and discharge surplus water. Treatment involves a two-stage neutralization with lime to remove fluoride and phosphate, followed by aeration to remove ammonia, then the addition of sulfuric acid to reduce the pH to 6-7. Even after treatment, the conductivity of the treated water is higher than allowed and fresh water must be added before it can be discharged to the surface waters of the state. Finding or developing a technology that would significantly remove any or all of the soluble salts, or raise the pH of the process water economically, would be desirable.

#### **Approaches:**

- A. Develop effective economical treatment methods for process water at Piney Point and at other phosphogypsum stack locations.
- B. Reduce the volume of process water held as pore water in the phosphogypsum stacks.
- C. Improve the quality of process water by reducing the concentration of various soluble salts such as fluoride and phosphate.
- D. Develop technology to raise the pH of the process water to 2 or greater.
- E. Develop acceptable uses for partially treated process water, e.g., irrigation.

*See Pub. &  
Env. Health,  
Goal 4, App.  
A; Envir. &  
Recl, Goal 1,  
App. C.*

### **Goal 2. Reduce the accumulation of phosphogypsum in the stacks.**

Discussion: Phosphogypsum has the potential to become a major asset to the state of Florida. Phosphogypsum is a by-product of phosphoric acid manufacture. For every ton of phosphoric acid produced, approximately 5 tons of phosphogypsum are produced. Therefore, if acceptable uses can be found for phosphogypsum, it will have the benefit of improving the environment, economy, and welfare of the citizens of the state. Research has demonstrated that using phosphogypsum in both road building and agriculture offers substantial economic benefits without creating excessive risks. Other uses that are environmentally and/or economically desirable are also possible. The major effort in this area must be to obtain permission from the EPA and/or FDEP to use the phosphogypsum to obtain these potential benefits. Since it is highly unlikely that methods can be developed

which would use all phosphogypsum production, it is desirable to find methods which will reduce its rate of production.

**Approaches:**

- A. Develop and promote environmentally acceptable uses of phosphogypsum.
- B. Develop factual information on actual risks and economic benefits of various uses of phosphogypsum.
- C. Develop economically alternative phosphoric acid manufacturing technologies to reduce or eliminate phosphogypsum production.

*See Pub. &  
Env. Health,  
Goal 4, App.  
C.*

## MINING AND BENEFICIATION

### **Goal 1. Develop methods for reducing or eliminating clay settling ponds.**

Discussion: The Florida phosphate matrix (ore) is composed of roughly one-third each of phosphate, clay and sand. The clay must be removed before upgrading of phosphate using flotation. Therefore, approximately one ton of clay waste (phosphatic clay) is generated for each ton of phosphate rock product. This translates to nearly 100,000 tons/day of waste clay in Florida. Under current practice, phosphate clay slurry with an average solids content of about 3% is pumped through pipelines to clay storage ponds where the clay slowly settles.

Although impounding is the most economical method of waste clay disposal, it has several major disadvantages. Clay settling ponds occupy about 40% of mined lands and generally have limited use after reclamation, causing adverse economic impacts. The waste clay not only ties up a large amount of water, but a significant amounts are also lost through evaporation over the clay settling areas that can occupy up to 800 acres each. The impacts of clay settling ponds on the hydrological systems must be better defined.

#### **Approaches:**

- A. Develop and test technologies for reducing or eliminating clay settling ponds.
- B. Develop and evaluate alternative mining and beneficiation methods that do not generate waste clay slurry.
- C. Develop new consolidation models to guide reclamation of clay settling ponds.

*See Envir.  
& Recl.,  
Goal 1,  
App. A.*

### **Goal 2. Find environmentally acceptable uses for phosphatic clays.**

Discussion: Phosphate mining in central Florida generates approximately one ton of phosphatic waste clay for each ton of phosphate rock produced. Based on this ratio, over 1.5 billion tons of phosphatic clays have been generated by the Florida phosphate industry since its inception. Now that most higher-quality ore has already been mined, the concentration of phosphate in the waste phosphatic clays is often higher than that in the remaining matrix. On an annual basis, the industry produces about 30 million tons of waste clay with an average  $P_2O_5$  content of about 9%. This is equivalent to 9 million tons of phosphate rock containing 30%  $P_2O_5$ .

Another valuable component of phosphatic clay is the clay minerals. Numerous analyses indicate that clay minerals account for 50-80% by weight of phosphatic clay. Therefore, conservatively speaking, the Florida phosphate industry disposes of 15 million tons of clay minerals per year.

Recovery of the phosphate values and development of commercial uses for the clay minerals is not only desirable from the standpoint of resource conservation, but also could be important to the economic future of Florida, particularly of the mining counties.

**Approaches:**

- A. Develop a better understanding of the chemistry of phosphatic clays.
- B. Investigate methods of separating phosphate in phosphatic clay from other constituents.
- C. Develop uses for phosphatic clays as construction materials.
- D. Develop uses for phosphatic clays as fertilizers.

**Goal 3. Find environmentally acceptable uses for clay settling ponds.**

Discussion: Although many new disposal/reclamation approaches for phosphatic clays have been proposed and investigated, the conventional impounding method will play a significant role in waste disposal in the foreseeable future because most of the alternatives are significantly more expensive than current practice. The most practical approach may be continued efforts to find productive uses for the clay ponds while trying to reduce the total area of the ponds.

**Approaches:**

- A. Develop methods for accelerating the dewatering of clay settling ponds
- B. Develop alternative uses for clay settling ponds, e.g., to produce water for domestic, commercial or industrial use

*See Envir.  
& Recl.,  
Goal 2,  
App. D.*

**Goal 4. Develop technologies for solving the dolomite problem.**

Discussion: Among the deleterious materials ( $\text{Fe}_2\text{O}_3$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{CaO}$ ,  $\text{MgO}$ , F) in phosphate rock feed for phosphoric acid production,  $\text{MgO}$  is the most common and the one which causes the most problems. Generally, the phosphate rock acidulation process requires a feed of less than 1%  $\text{MgO}$ . This feed requirement has not been achieved in Florida at a commercial scale by removing magnesium from rock containing more than 2%  $\text{MgO}$ . Phosphate rock which does not meet the requirement consumes too much sulfuric acid per ton of  $\text{P}_2\text{O}_5$  produced in the wet phosphoric acid process. In addition,  $\text{MgO}$  in the wet acid reduces the filtering capacity and ties up an equivalent amount of  $\text{P}_2\text{O}_5$  when acidulated.  $\text{MgO}$  also causes problems in the production of diammonium phosphate fertilizer (DAP), which has a strict requirement for the minor element ratio (MER), of which it is a constituent.

With the depletion of the higher-grade, easy-to-process Bone Valley deposits, the central Florida phosphate industry has moved into the lower-grade, more contaminated ore

bodies from the Southern Extension. The phosphate deposits in the Southern Extension may be divided into two zones: an upper zone and a lower zone. Rock in the upper zone can be processed readily using the current technology; however, the lower zone is highly contaminated by dolomite. Geological and mineralogical statistics show that nearly 50% of the phosphate resource would be wasted if the high-dolomite deposits were bypassed in mining.

FIPR has recently developed a feasible technology, designated as the CLDRI fine flotation process, for high-dolomite pebbles. Pilot testing has demonstrated both the technical and economic feasibility of the CLDRI process. The CLDRI process may be commercialized in the near future; however, improvements in the CLDRI process and developments of other technically feasible and practical technologies are desirable.

**Approaches:**

- A. Foster use and improvement of the CLDRI process
- B. Develop techniques to float relatively coarse dolomite
- C. Develop selective dolomite collectors

**Goal 5. Improve mining and transportation efficiency.**

Discussion: For over half a century, surface mining using draglines has been the predominant method for phosphate mining in Florida. The dragline scoops out the top 15 to 30 feet of overburden and places it in spoil piles to the side of the mine pit. The dragline then digs out the phosphate matrix (ore). The overburden averages 25 feet in thickness in the Bone Valley deposit and 30 feet in the Southern Extension, while the matrix thickness is about 17 feet in the Bone Valley and 39 feet in the Southern Extension.

The matrix is slurried using high-pressure water guns, and then pumped via pipeline to a processing plant, which can be up to 10 miles away. At the beneficiation plant, the first operation is separation of the clay from phosphate and sand. The waste clay, with an average solids content of about 3%, is pumped through pipelines to clay storage ponds where the clay slowly settles.

This practice is energy-intensive for three major reasons. First, the thirty-foot overburden has to be dug out and later put back for reclamation. Pumping the matrix consumes a lot of energy because of the long distance pumping at low solids concentrations (less than 40%). Finally, the clay fraction is pumped twice, first with the matrix and then as a dilute slurry.

**Approaches:**

- A. Evaluate alternatives to draglines
- B. Develop and test low-cost transportation methods for matrix and tailings

## **Goal 6. Improve flotation efficiency.**

Discussion: In the conventional flotation (the Crago “double float”) process, about 30-40% by weight of the sands in the feed are floated twice, first by fatty acid, and then by amine. The Crago process is, therefore, inefficient in terms of collector utilization. Another major drawback of this process is the deoiling step. Deoiling consumes a significant amount of sulfuric acid. Insufficient deoiling often causes loss of phosphate and poor concentrate grade. Yet another problem with the Crago process occurs in the amine flotation step. Not only are amines more expensive than fatty acids, they are also very sensitive to water quality, particularly the clay content in water. Numerous experiments have indicated that phosphate flotation could be improved by reducing chemicals use by up to 50% (10 million gallons/year) and increasing  $P_2O_5$  recovery by 5-10% (1.2 million tons/year).

Another possible approach to achieve a significant improvement is real-time control of each of the unit operations. Process control systems are routinely used in mineral processing. It is expected that control systems of future will continue to develop towards user-friendly computer-based systems that use powerful software analysis and control techniques.

### **Approaches:**

- A. Develop alternatives to the Crago “double float” process
- B. Develop more efficient desliming technologies
- C. Test high-throughput, energy-saving flotation equipment
- D. Develop and evaluate online analyzers and process control systems

## ENVIRONMENT AND RECLAMATION

### **Goal 1. Evaluate the effects of phosphate mining, processing and reclamation on the environment and develop methods for minimizing and ameliorating impacts.**

Discussion: In the legislation that created FIPR, the Institute's mission included study of the environmental effects of phosphate mining and reclamation as well as the disposal and utilization of phosphatic clay, together with the related environmental and land use issues.

Historically, clay settling areas (CSAs) have occupied about 40% of the area disturbed by mining. Because the clay is much less permeable than the native sandy soils, there is concern about the impact these CSAs may have on surface and ground water. There is also concern that CSAs may have less ecological or economic value or usefulness than unmined lands or other types of reclaimed land.

*See Chem. Proc., Goal 1, App. E; Goal 2, App. A.*

Phosphogypsum may be used in a variety of beneficial ways. Chemical plant process water, following treatment to various degrees, may be recycled for industrial uses or can be used in other ways that have positive or neutral environmental impacts.

The public has expressed concerns about the impacts of mining on wildlife and their habitats.

#### **Approaches:**

*See Min. & Ben., Goal 1, App. C.*

- A. Evaluate the impacts of clay settling areas on surface and ground water hydrology
- B. Find ecological, hydrologic and economic uses for clay settling areas, including wetlands, forests, wildlife habitat, water treatment, and agriculture
- C. Find environmentally acceptable uses of process water treated to various degrees along with disposal or use of water treatment sludges
- D. Evaluate the suitability of habitat on reclaimed lands to support wildlife and monitor wildlife utilization of this habitat

*See Chem. Proc., Goal 1, App. E.*

### **Goal 2. Develop reclamation technology.**

Discussion: In the legislation creating FIPR, the Institute's mission included the study of reclamation alternatives and technologies, including wetlands reclamation. Reclamation may be defined as the process of returning mined land to a useful condition. The process includes reshaping the land and establishing vegetation. For natural systems, native plants must be established and exotic plants or weeds must be controlled.

Cogongrass, considered as one of the world's worst weed problems, has infested thousands of acres of mined lands and needs particular attention.

Since 1975, reclamation has been required by state law, and several of the counties also have mining and reclamation ordinances.

The public has expressed concerns about the value and potential/possible uses (both economic and ecological) of mined lands, the quantity and quality of surface and ground waters, and the restoration of natural ecological and hydrologic systems. The mining industry is concerned about obtaining mining permits (which require reclamation) and achieving the reclamation and environmental requirements in a cost-effective manner.

**Approaches:**

- A. Develop methods to restore to the extent feasible the functions of ecological systems
- B. Develop methods to reclaim areas disturbed by mining
- C. Develop methods to minimize impacts of phosphogypsum stacks and develop cost-effective, environmentally sound methods for their closure
- D. Develop uses for clay settling ponds
- E. Develop methods to control exotic plants and weeds
- F. Develop methods to establish native plant communities in wetlands and uplands
- G. Improve understanding of ecosystem functioning on disturbed and reclaimed lands
- H. Develop methods to improve wildlife habitat on reclaimed mined lands and facilitate recolonization by wildlife

*See Chem Proc. , Goal 2.*

*See Min. & Ben., Goal 3, App. B.*

*See Pub. & Envir. Health., Goal 4, App. G.*

**Goal 3. Increase knowledge of the functioning of hydrologic systems in mining areas and develop methods for enhancing them.**

Discussion: With increasing population pressure, Florida's water supply (both in terms of quantity and quality) is of utmost importance. Proper water flow is necessary both to supply human needs and to maintain the ecological health of the Peace River, its tributaries, and the Charlotte Harbor estuary. Research on ways to improve water supply, stream flow, aquifer recharge, and water treatment is important. Mined lands present opportunities for water treatment and storage and this potential should be investigated further.

**Approaches:**

*See Min.  
& Ben.,  
Goal 1,  
App. C.*

- A. Evaluate and improve the hydrologic functioning of clay settling ponds
- B. Evaluate the impact of phosphate mining on the hydrology of the Peace River and other surface and ground water systems.
- C. Evaluate use of mined lands for water treatment and storage
- D. Continue development of the FIPR Hydrologic Model

## **PUBLIC AND ENVIRONMENTAL HEALTH**

### **Goal 1. Evaluate the occupational, public, and environmental health aspects of phosphate industry emissions and by-products.**

Discussion: There are chemical hazards associated with the phosphate industry. The emissions include sulfur dioxide, ammonia, sulfuric acid, and silicon tetrafluoride. Other potential emissions are radon gas; fugitive dusts from product storage and phosphogypsum stacks; and leachate from phosphogypsum stacks. For the mining and beneficiation sites, flotation reagents are biodegradable and are further attenuated by sandy soil before reaching the surficial aquifer, except in the case of fuel oil. The spatial migration and persistence of fuel oil in the environment should be studied further. FIPR should attempt to determine whether fuel oil migrates to sensitive water bodies or private drinking water or irrigation wells.

A major concern is the accidental release of acidic pond water from phosphogypsum stacks, or wash water from clay settling areas. A release can cause acute changes in pH and dissolved oxygen to which aquatic and marine organisms and ecosystems are generally sensitive. Over time, accumulation of nitrates and phosphates can also pollute water bodies.

#### **Approaches:**

- A. Conduct and sponsor studies of chemical emissions to further evaluate their health impacts for the phosphate regions
- B. Continue studies to evaluate occupational related risks to the health and safety of persons employed within the phosphate industry due to exposure to inhaled or absorbed chemicals such as sulfuric acid mist
- C. Conduct and sponsor studies of the spatial migration and persistence of fuel oil in the environment
- D. In collaboration with FIPR's Information Services and Education Programs, conduct educational programs to inform the public about environmental issues related to health concerns, with emphasis on relative risks

*See Educ.  
Prog.,  
Goal 6,  
App. B, and  
Inf. Svcs. &  
Lib., Goal 4,  
App. I.*

### **Goal 2. Evaluate the occupational, public, and environmental health aspects of exposure to technologically enhanced naturally occurring radioactive materials (TENORM).**

Discussion: The magnitude and consequences of radioactivity and radiation in the phosphate industry have been studied since FIPR's inception. There will always be new technologies and unforeseen situations that alter the accumulation, concentration and exposure to radioactive materials. The science of radiation protection also grows and adapts as empirical data are obtained. The various scientific bodies mold the science into

recommendations that are adopted in whole or in part by governing bodies that set regulatory limits. As the situations, recommendations and limits change, studies must be conducted to address them.

**Approaches:**

- A. Conduct and sponsor studies of radiological contaminants in air, water, and soil in the phosphate regions to further evaluate their impacts on public and environmental health
- B. Evaluate occupational-related radiation risks to the health and/or safety of persons employed within the phosphate industry
- C. Conduct educational programs to inform the public about natural radioactivity and radiation in the phosphate industry and environment, with emphasis on relative risks

*See Educ.  
Prog.,  
Goal X,  
App. Y.*

**Goal 3. Develop procedures or technology to reduce risks of occupational-related illness or injury to persons employed within the Florida phosphate industry.**

Discussion: Previous FIPR research evaluated such issues as noise and ground vibration at mine-site boundaries, production of radon-resistant foundations for residential housing, and biological control of mosquitoes. Some studies evaluate health and safety problems without offering practical solutions while others do. FIPR should encourage more practical research designed to develop procedural or mechanical controls to reduce chronic injuries, such as hearing loss, and acute injuries, such as electrocutions and falls. In some cases, modifications to current technology might improve safety by simply increasing the probability of its use by workers. For example, cost-effective improvements in respirator materials or design that makes them less stressful to wear might encourage their use.

**Approaches:**

- A. Develop recommendations for administrative or procedural controls to further reduce present or newly discovered occupational hazards in the phosphate industry
- B. Develop mechanical controls and new technologies to further reduce present or newly discovered occupational hazards in the phosphate industry
- C. Search for ways to improve existing personal protective equipment to increase efficiency and reduce physical stress for wearers

*See Min.  
& Ben.,  
Goal 5,  
App. A.*

**Goal 4. Evaluate the occupational, public, and environmental health aspects of technologies, procedures, and practices developed by FIPR through the Mining and Beneficiation, Chemical Processing, Reclamation, and Public and Environmental Health research programs.**

Discussion: FIPR's research projects are evaluated in terms of improvements in cost, phosphate recovery, water use, waste reduction, habitat restoration, etc., and must be at least environmentally neutral and preferably beneficial. Some projects or Technical Advisory Committee recommendations may have environmental or public health impacts that are largely unknown. For example, if treated process water is discharged to the ocean, the effects on the dinoflagellate that causes red tide may need to be investigated.

**Approaches:**

- A. Evaluate environmental and public health consequences of treatment processes developed for process water at Piney Point and other phosphogypsum stacks
- B. Evaluate exposure pathways from removal to ultimate disposal for technologies that reduce the concentrations of hazardous constituents, such as fluorides and arsenic, in process water
- C. Evaluate environmental and public health consequences of proposed uses of phosphogypsum
- D. Evaluate environmental and public health consequences of proposed uses of clay settling ponds
- E. Evaluate environmental and public health consequences of commercial uses for phosphatic clays, such as building tiles and lightweight aggregates
- F. Evaluate radionuclide, metal, and metalloid (e.g., arsenic) concentrations in soil and water for pre-mining areas as new sites are permitted to establish baselines for mining and post-mining comparisons
- G. Evaluate radionuclide, metal, and metalloid concentrations in flora and fauna for pre-mining areas to establish baselines for mining and post-mining comparisons
- H. Evaluate the impact of mining on the concentrations of potentially harmful constituents in water and sediments of the Peace and Alafia Rivers

*See Chem. Proc., Goal 1, App. E.*

*See Chem. Proc., Goal 2, App. B.*

*See Min. & Ben..., Goal 3, App. B.*

*See Min. & Ben..., Goal 2, App. C.*

*See Env. & Recl..., Goal 2, App. G.*

**Goal 5. Respond to new occupational, public, and environmental health concerns raised by the public, the phosphate industry, and governmental agencies.**

Discussion: There is always the potential for unforeseen hazards, and reassessment of known hazards. Regulatory standards can change such that administrative and mechanical controls are no longer adequate, and the industry requires new practical solutions to reduce

worker exposures to potentially harmful substances. Education of the public in these matters is an ongoing process. Educational materials must be continually updated for content, such as new limits or risk estimates, and new media avenues, such as Web-based training, should be explored.

**Approaches:**

*See Inf. Svc. & Lib., Goal 3, App. G.*

A. In conjunction with FIPR Library and Information Services staff, establish databases of information related to common queries from the public on potential contaminants of concern

B. Conduct evaluations and studies to define the current state of knowledge, gather industry-specific data, and determine the degree of hazard of each item of concern

*See Educ. Prog., Goal X, App. Y.*

C. Continue to develop multimedia products, such as computer programs and videos, to educate the media, politicians, and members of the public, and for use by teachers in the Teacher Education Program

*See Tech. Trans., Goal 2, App. D; Educ. Prog., Goal X, App. Y; Inf. Svc. & Lib., Goal 4.*

D. Raise the level of public awareness of health issues through the Technology Transfer Program, the Teacher Education Program, Information Services, workshops, and lectures

## **PROGRAMMATIC WORK AREAS**

**Technology Transfer**

**Information Services and Library**

**Teacher Education Program**

## TECHNOLOGY TRANSFER

**Goal 1. Further develop and enhance technology transfer to ensure that interested parties are aware of the Institute's latest research and have ready access to the results of this research in a form that facilitates its use.**

Discussion: The Technology Transfer Program at FIPR has two principal components: the gathering of resources and information from the entire Institute, and the development of a program to disseminate this information to interested parties. It is clear that the information gathering effort is expanding with improved library services, the Internet presence and Intranet development. The Program may need to expand further if some of these new technologies require support. Electronic copies of FIPR's publications are made available to the public through the FIPR website designed and maintained by the Library and Information Services staffs. While this makes research results readily available to all, they may not be seen by professionals in a position to implement new technologies, and may not be understood by a wider audience. Professionals can be notified of new publications if they are targeted for topic-specific mailings, and their current contact information is entered and verified in the mailing database. Members of the public who are interested in FIPR's research, but may not be technically oriented, need results presented without technical jargon in ways that are Internet browser-friendly, such as pages of Frequently Asked Questions (FAQs) or non-technical abstracts by topic.

### Approaches:

- A. Provide, through the use of Internet technology, FIPR- and industry-related information for release, access and future decision-making
- B. Provide information on FIPR research through the Library, Information Services and Teacher Education Programs
- C. Publish research results
- D. Develop technologies and procedures to deliver targeted information and research results to appropriate professionals
- E. Obtain equipment and software to use Geographic Information Systems (GIS) to quickly aggregate and analyze spatially referenced data for Staff and Library patrons
- F. Conduct demonstration projects to show the feasibility and practicality of FIPR research
- G. Provide technical support, through FIPR Staff and its contractors, to users of FIPR research and technologies
- H. Conduct and sponsor workshops and conferences

*See Inf. Svc. & Lib., Goal 4, Apps. G & I; Educ. Prog., Goal 2.*

*See Inf. Svc. & Lib., Goal 4, App. B.*

*See Educ. Prog., Goal 2.*

**Goal 2. Further develop the computer program “MiLo” as a tool to document and retain FIPR’s institutional knowledge.**

Discussion: MiLo started as a research project to determine whether it is possible to obtain comprehensive knowledge from a phosphate and fertilizer expert, FIPR’s Chemical Processing Research Director Mike Lloyd, and then assemble that information into a computer program in a meaningful way. MiLo attempts to present the gathered knowledge in such a way that it demonstrates the formation of the expert’s reasoning process, provides a structure for others to use that process, and provides information and insider knowledge that the expert believes is critical for a proper understanding and evaluation of challenges faced by the industry. All of this must be designed to be understandable to a variety of users, and must offer ways for the information to be extracted satisfactorily and easily. Through accounts of Mr. Lloyd’s life, the formulation of “Mike’s Rules of Order,” (his approach to problem-solving) inclusion in the program of important information identified by Mike, and contributions from other experts recommended by Mike, the project passed proof of concept. With that milestone achieved, the project advanced from a research effort to an internal operational process.

FIPR Staff have many information needs that MiLo can serve. It can provide information in the various research areas to assist in the evaluation of proposals, present background information and the latest research for use in the Teacher Education Program and Information Services, list definitions of key terms, and display annotated graphics, video clips, flow diagrams, and more. In addition, “spin-off” or derivative products based on the MiLo model that also borrow its content are needed to facilitate FIPR’s mission. For example, MiLoRad was created as a way to explain basic concepts about radioactivity in the phosphate industry and put the health risks in perspective. The Teacher Education Program also needs a derivative product targeted at teachers. This product would provide a frame of reference for phosphate industry information as it relates to the Sunshine State educational standards, with emphasis on FCAT preparation. The Technology Transfer Program must be funded commensurately to create these tools, and with enough flexibility to provide for future ideas and innovations.

**Approaches:**

- A. Provide funding for content development and continued maintenance of MiLo as a global Technology Transfer vehicle
- B. Adopt a business plan for commercial exploitation of MiLo with special allowances for Florida customers
- C. Develop MiLo by editing existing content, adding new content, and approving content for public use
- D. Develop MiLo derivative products, including MiLoRad, to serve special needs or users
- E. Develop operational and maintenance procedures for MiLo

*See Educ. Prog., Goal 4, App. F; Pub. & Envir. Health, Goal 4, App. D.*

**Goal 3. Further develop internal FIPR technology transfer through the use of local area networking and Intranet file sharing.**

Discussion: A populated internal network Web-based structure can facilitate information sharing within FIPR in a variety of ways. A rudimentary structure is already in place that allows users to easily access the FIPR mailing database to retrieve phone numbers and addresses of contractors and others who actively interact with FIPR. In addition, this Intranet can be used to share schedules, review documents, provide progress reports on FIPR research, share presentations, access graphics, share data, and more.

**Approaches:**

- A. Develop FIPR's internal electronic network as a platform for scheduling and document review
- B. Develop databases for contact information, graphics, and other resources frequently used and shared by FIPR personnel

**Goal 4. Promote the commercial use of technology developed through FIPR's research programs.**

Discussion: Potentially viable commercial technologies are developed through FIPR research, particularly in the Mining & Beneficiation and Chemical Processing areas. Some of these technologies are placed into service while others are not, for a variety of reasons including economics and lack of awareness. FIPR strives to assure that the economics of these technologies are well known. In some cases, new technology might not be practical for Florida operations, but might be ideal for a new facility elsewhere in the world. FIPR must raise awareness of its research, particularly in the Florida industry. As a funding source, FIPR has patent rights and is encouraged to seek a return on its investment when appropriate. Effective relationships between FIPR, the phosphate companies, the regulatory agencies, and the industrial and commercial business sector must be fostered to develop and commercialize technologies that can and will be used.

**Approaches:**

- A. Pursue patents for innovative technologies
- B. Identify and establish a dialogue with senior corporate officers, senior level regulatory officials, legislators and others who have the ability to implement and foster new technologies
- C. Conduct seminars and field demonstrations on a periodic basis, according to the accumulation rate of new technologies, for the individuals identified in Approach B.

## **INFORMATION SERVICES AND LIBRARY**

### **Goal 1. Integrate the Information and Communications work areas.**

Discussion: All Information and Communication work areas support the same mission at FIPR: to circulate and explain the information FIPR generates and collects to the Institute's broad variety of constituents. To do this well, the information should be developed and distributed in a consistent manner, clearly identifying the information as coming from FIPR.

#### **Approaches:**

- A. Develop and implement a consistent look and feel to information and communication materials produced by and/or for the FIPR Library, website, Education Program, Research Areas and Public Information
- B. Improve communication between FIPR's information generating departments—Public Information, Library, Education and Technology Transfer—to ensure that information is accurate, current, and is distributed appropriately

*See  
Educ.  
Prog.,  
Goal 5,  
App. A.*

### **Goal 2. Improve the exchange of information between the research areas and the information areas.**

Discussion: Improving the process used to keep the technical community and the public aware of FIPR research findings, both past and present, is necessary to make the scope, depth and usefulness of FIPR's research and knowledge more evident and to define who needs more information about the research.

#### **Approaches:**

- A. Develop and implement a process for FIPR research directors to share significant progress on ongoing projects, and to update research and information staff members on outcomes of completed projects and how this information may be used
- B. Update newly approved, continuing and completed research on FIPR's website and in printed materials as needed

### **Goal 3. Develop an integrated information resource system.**

Discussion: Continued development of information resources is critical to FIPR's ability to inform its constituents about the Institute's mission and accomplishments. In order to do this effectively, the various research and programmatic areas must be part of an overall, integrated information system that includes the FIPR Library, Technology Transfer, and Teacher Education Program.

## Approaches:

### A. Continue development and maintenance of MiLo, including:

*See Tech. Trans., Goal 2, App. C.*

*See Pub. & Envir. Health, Goal 4, App.D.*

*See Educ. Prog., Goal 5, App. C.*

- Developing a process for reviewing and updating the information contained in it
- Supporting the development, publicity and use of MiLoRad
- Developing a MiLo component to support the Education Program's informational needs
- Defining how MiLo can be used by technical and non-technical users

### B. Broaden the content of FIPR's website and establish a procedure for its maintenance and expansion. Content expansion areas include, but are not limited to:

- Posting FIPR's latest research highlights and news and contacting key information users with either the posting or a summary of highlights from the posting
- Building a resource for basic information about phosphate issues
- Building a new section on the website having to do with FIPR's laboratories, their personnel and any services offered
- Revamping the overall look of the website and improving its functionality
- Integrating Web-updating mechanisms with the biannual report process
- Including a Web-searchable Library catalog
- Compiling and presenting pertinent Florida phosphate data, statistics and information
- Including video with streaming capabilities
- Adding selected presentations or papers
- Posting samples of good research proposals to help guide new researchers in the preparation of their proposals
- Developing a public version of MiLo for the Web
- Expanding the Teacher Education Section of the FIPR website

*See Tech. Trans., Goal 2, App. B.*

C. Provide strategic leadership in the continued development of the information component of FIPR's Teacher Education Program by:

- Creating tools that use FIPR information and educational resources to teach teachers about phosphate and ways in which the topic can be used to meet Sunshine State Standards in science, social studies, language arts and math, and that assist the public's understanding of FIPR's education efforts. Such tools include, but are not limited to:

*See Educ. Prog., Goal 4, App. E.*

- A derivative version of MiLo designed to support FIPR's Teacher Education Program needs
- An Education Program section of the FIPR website, which would include a forum for teachers to exchange ideas and seek information
- Teaching units, activities and publications developed by or through FIPR
- A catalog of resources and experts to improve the ability of teachers to teach the content FIPR provides
- Proceedings or highlights from training programs and workshops
- Publicity materials for the Education Program
- A showcase for teachers and the teaching units they have developed for and with FIPR

*See Tech. Trans., Goal 2, App. D.*

*See Educ. Prog., Goal 4, App. E.*

D. Assist the Education Program in building, organizing and implementing procedures for a Media Center collection that will include materials related to education and the Education Program in a variety of formats

*See Educ. Prog., Goal 8, App. A.*

E. Integrate the new Media Center collection into that of the FIPR Library and establish appropriate operating and lending policies for Media Center materials

F. Formalize a relationship between the FIPR Library and the University of South Florida (USF) Library that will be of significant mutual benefit

G. Add to existing internal Library databases and bibliographies and create others as needed to allow easy access to Library information and provide improved searchability for Staff

*Approaches G through K all relate to Tech. Trans., Goal 2, App. A.*

H. Identify publicly available electronic phosphate-related resources including, but not limited to, the Web

*Approaches  
G through  
K all relate  
to Tech.  
Trans.,  
Goal 2,  
App. A.*

- I. Continue to improve Library resources by weeding the collection, identifying and addressing informational gaps, and organizing the map collection to make it more useful. Information gathered in the survey done in May 2001 should be helpful in defining areas of the Library collection and services that need expansion.
- J. Evaluate the usefulness of the FIPR Intranet as a tool to improve internal communication and consider expanding the content to include material such as news releases, notices, agendas, research updates, and databases of use to FIPR staff
- K. Continue the development of FIPR's contact database used for mailings and general internal informational purposes, by:
  - Improving the coding system so it can be better understood and used
  - Making better use of the comments field to more precisely identify each contact's relationship to FIPR
- L. Develop a graphics library to catalog pictures, slides, maps, videos and other graphic materials in support of FIPR presentations and publications

#### **Goal 4. Improve the public's awareness of FIPR and its work.**

Discussion: In a 2001 statewide survey funded by FIPR, it was determined that there exists a broad lack of knowledge on the part of Floridians about the state's phosphate industry and its impacts on the State's people, environment and economy. Additionally, it was found that few Floridians know what FIPR is and what it does. This situation needs to be addressed.

#### **Approaches:**

- A. Define the information the public needs to better understand phosphate issues and the mission of FIPR, and implement methods for providing it
- B. Develop ways to increase exposure to, and understanding of, FIPR's Education Program as a way to improve science and math teaching in schools
- C. Streamline the process of developing brochures, annual reports, newsletters, one-page issue briefings, research updates and other public information resources by first putting the information on FIPR's website and then using that information as a basis for developing other publications
- D. Through a closer association with the USF Library, link FIPR Library resources with regional and State University System library catalogs

- E. Provide public access in the FIPR Library to USF virtual library databases
- F. Continue FIPR's leadership role in the library planning and policy development for the region
- G. Support distribution of FIPR information at workshops, conferences and training sessions
- H. Post annual reports on the Web and make them available on electronic media such as CDs or DVDs in order to minimize printing costs and prepare them more rapidly
- I. Support Technology Transfer efforts at FIPR by:
  - Assisting in efforts to fill research gaps in MiLo
  - Developing procedures for including new information in MiLo that would be useful to the public
  - Evaluating how MiLo's technical information can be used by groups that provide continuing professional education
  - Supporting FIPR's involvement in technical conferences
  - Supporting the planning and execution of the Annual Regional Phosphate Conference
  - Identifying and adding interested persons or organizations to FIPR's contact database
- J. Improve the ways people can find information on FIPR's website by:
  - Providing a central location where information and registration services for the phosphate conference can be accessed
  - Developing the capability to accept credit card payments for Phosphate Conference registration fees
  - Posting interactive forms for grant proposals for both research and education
  - Using FTP capabilities to improve the ability of FIPR Staff to communicate when away from the office
  - Adding publications in .pdf format as they become available

*See Tech.  
Trans.,  
Goal 2,  
App. D..*

- K. Make targeted FIPR presentations to appropriate persons at institutions of higher learning and consulting firms in order to broaden the base of future research proposals
- L. Continue development of issue-oriented CDs for distribution to appropriate persons
- M. Continue developing relationships and meeting with key interested parties, such as legislators, phosphate county school district members, and educational and environmental groups and the media, to keep current with them and to provide background, perspective and technical information on FIPR research and programs
- N. Improve staff use of the FIPR Intranet as a tool to improve FIPR's overall communication efforts with the public

*See Tech.  
Transfer,  
Goal 3,  
App. A.*

## **TEACHER EDUCATION PROGRAM**

### **Goal 1. Provide resources of the Education Program to all phosphate counties.**

Discussion: Training formats, lesson plans and materials have been developed over the last 5 years with Polk County teachers. Their work has been sufficiently reviewed, pilot tested and revised so that they are ready to be introduced to other counties. When the Teacher Education Program began 5 years ago, a long-term goal was to bring the program to teachers in other phosphate counties. In addition, teachers and administrators from other counties have heard about FIPR's program and are requesting training and resources.

#### **Approaches:**

- A. Interview former participants from targeted counties to learn county needs
- B. Research how the education system works in other phosphate counties
- C. Build partnerships with curriculum coordinators and superintendents
- D. Establish teams of teachers from each county and train them at workshops
- E. Collaborate with teams to develop training programs for their counties
- F. Host two to three fall training workshops for new counties, with teams as facilitators
- G. Hold two workshops in the summer, if necessary, to accommodate larger numbers

### **Goal 2. Develop additional training workshops with specific content instruction to meet the needs of pre-service and contracted teachers.**

Discussion: There is a shortage of qualified science and math teachers all over the state. The shortage has caused universities to reduce the course load to graduate students, but this only increases the problem by producing teachers with limited content knowledge. In addition, many teachers are forced to teach courses out of their field. Veteran teachers who have attended FIPR's program and who do understand how to teach this content as it relates to local issues are reaching retirement age and the educational community is now in danger of losing their expertise. Many teachers do not have the depth of knowledge needed to engage students in scientific inquiry and critical thinking about issues.

#### **Approaches:**

- A. Partner pre-service teachers with practicing teachers in a second summer session to create a relationship for sharing ideas about teaching phosphate information

- B. Build relationships with other scientific research agencies to create a network of scientists to help teach content related to the Sunshine State Standards
- C. Create separate one-week sessions that are grade-level-specific and content-oriented to teach local science content as it relates to the Standards, with help from local scientists and former workshop participants serving as the trainers for the teachers
- D. Conduct day-long in-service workshops concerning basic content for curriculum units at each grade level with curriculum authors and research directors as trainers
- E. Work with research directors to develop projects for high school students, then create in-school workshops at high-schools to instruct teachers in how to manage the projects
- F. Conduct half-day seminars providing more detail on specific topics that need clarification for former participants and the general public
- G. Partner with the USF Education Department to provide college-credit courses to validate the content and experience offered to teachers by the summer session

**Goal 3. Define content basics and best practices for integrating phosphate material with standards.**

Discussion: As a result of the MiLo Project, a wealth of information from Mike Lloyd about phosphate mining and processing and their impacts has been documented and organized. This information needs to be processed into a format that teachers can use. The information also must go through a review process with the research directors to ensure its accuracy and maintain a high standard of quality. Nationally certified teachers and top curriculum writers from mining counties will work together to define the scope and sequence of information that is appropriate for the classroom at each grade level.

**Approaches:**

- A. Develop a curriculum framework for what should be taught and in what order
- B. Align topics of the curriculum framework to Florida educational standards
- C. Determine what information is appropriate for each grade level
- D. Have the curriculum framework reviewed by the FIPR research directors, education specialists and nationally certified teachers
- E. Research the school systems and training needs of each county

- F. Identify best practices for teaching phosphate information
- G. Publish the curriculum framework and make it electronically accessible
- H. Coordinate with other education programs with similar goals.

**Goal 4. Expand existing resources and develop new resources that support the curriculum.**

Discussion: Currently, there are five key concepts of phosphate-related information for which materials have been created. However, the information is not available for every grade level. The materials need to be modified or created where appropriate to meet the Sunshine State Standards at each grade level so each grade level has information that builds upon the previous year. Whatever FIPR develops must originate with teachers so that they have ownership of the curriculum and materials that will be used.

**Approaches:**

- A. Publish thematic units for each grade level group and solicit similar units at other grade levels
- B. Develop additional traveling libraries for each grade level that correlate to the key content ideas
- C. Continue the mini-grant program for teachers and make improvements to the process where necessary
- D. Complete the “Teachers Dig It” (# 00-MED-0012 LP) and “We Are the Future” (# 00-MED-0013 LP) projects
- E. Develop a database of lesson plans created at the workshops to be housed and accessible on the FIPR website
- F. Develop a derivative of MiLo (MiLoEdu) that focuses on education
- G. Develop information packets on key issues related to the phosphate industry and its impacts
- H. Collaborate with research directors to develop high school research activities
- I. Collaborate with research directors to create self-directed, interactive learning modules that can be centered around topics of special interest as needed
- J. Foster relationships between FIPR’s Education Program and college education programs to improve teacher training for math and science

*See Inf. Svcs. & Lib., Goal 3, App. C.*

- K. Provide opportunities for project-based instruction at secondary school levels
- L. Create a virtual, traveling science lab station to gather and maintain data and provide training in the scientific method

**Goal 5. Distribute materials to interested teachers and programs.**

Discussion: All of the educational resources and materials that FIPR creates are correlated to the Florida Sunshine State Standards, which are a reflection of national education standards. These standards drive the curriculum choices that are made by every school board across the nation. Therefore, FIPR resources will be useful to teachers in every state and will serve to unify some of the curriculum that is taught throughout the country. It will also offer a model that can be applied to other subjects of local interest to help teachers meet educational standards and close the achievement gap among communities.

FIPR will receive direct benefit from these efforts. There are programs in other states, such as Nevada, which have provided insight and materials that have proved extremely useful to FIPR. By continuing to develop relationships across the nation, FIPR will have access to these insights and materials.

**Approaches:**

- A. Send copies of published lesson plans and units to current and former Workshop participants
- B. Create access to the lesson plan database through FIPR’s website
- C. Provide training sessions on MiLo for Education to teachers
- D. Continue to interact with the Nevada Division of Minerals Education Program
- E. Present FIPR’s program and its curricula at state and national education conferences

*See Inf.  
Svcs. &  
Lib., Goal  
3, App.C.*

**Goal 6. Develop a formal program to have research directors and other experts review and clarify content and materials created for the Education Program.**

Discussion: It is critical that whatever information FIPR gives to the public and teachers through the Education Program be scientifically and factually accurate. Materials and content developed by the Education Program should undergo a review process similar to that used in FIPR’s research programs. This will assure that they maintain high quality and are used consistently across all FIPR programs. Sources for information presented in the Education Program should be made available to teachers and those for written material should be formatted as specified by the FIPR Style Manual.

**Approaches:**

- A. Hold regularly scheduled meetings with research directors and public information staff to review Education Program products and content
- B. Develop additional independent learning centers like MiLoRad for the other research areas
- C. Revise and develop new activities that illustrate difficult scientific concepts that are applied in various processes of the phosphate story

*See Pub. &  
Envir. Health,  
Goal 4, App.  
D.*

**Goal 7. Develop a sufficient, well-trained staff capable of conducting the expanded Education Program.**

Discussion: With the new Education Media Center and the Program's expansion into other counties, the staff of the Teacher Education Program will need some restructuring, and additional staff will be needed. There will be much more collaboration with the research directors and new materials will be developed that will require expertise the staff does not currently possess.

**Approaches:**

- A. Define staffing needs according to program priorities and goals
- B. Evaluate the skills and abilities of existing staff to meet goals, and identify areas that need to be addressed
- C. Train existing staff in new skills and hire additional staff when necessary
- D. Where appropriate, hire teachers who have participated in the FIPR Education Program as independent contractors to work as curriculum consultants for new counties

**Goal 8: Develop the Education Building into a valuable resource center for FIPR and the public.**

Discussion: The Education Building was designed with some unique features to facilitate training seminars, meetings and professional discussions. In addition, all FIPR staff members will use the rooms and materials in the building as needed. Many FIPR events and functions that are currently held elsewhere could be accommodated in the new Education Building. For example, the county school board's curriculum coordinators and teachers need resources that explain how phosphate, as an important subject of local interest, can be used to meet educational standards. In addition, other state and local agencies could also request use of the facilities for their needs. The public is also welcome to use the Media Center as a place to study and learn about phosphate as it affects their daily lives.

## **Approaches:**

*See Inf. Svcs.  
& Lib., Goal  
3, App. D.*

- A. Build, organize and implement procedures for a Media Center collection that is consistent with, and fully integrated into, the main FIPR Library collection
- B. Develop procedures for reserving space in the education building for FIPR and public events
- C. Create and publish a set of guidelines for using the education building space
- D. Inform interested parties, such as teachers, about the facility's learning centers

# **LEGISLATION ESTABLISHING THE FLORIDA INSTITUTE OF PHOSPHATE RESEARCH**

## **378.101 Florida Institute of Phosphate Research. --**

(1) There is created a Florida Institute of Phosphate Research, which is empowered:

(a) To conduct or cause to be conducted such environmental studies related to radiation and water consumption, or other environmental effects of phosphate mining and reclamation, as may from time to time be deemed reasonably necessary by the institute for the health, safety, and welfare of the citizens of this state and particularly the citizens of the regions where phosphate mining or processing occurs.

(b) To conduct or cause to be conducted a thorough and comprehensive study of reclamation alternatives and technologies in the phosphate mining or processing industry, including wetlands reclamation.

(c) To conduct or cause to be conducted a thorough and comprehensive study of phosphatic clay disposal and utilization as a part of phosphate mining, together with all environmental or land use related thereto.

(d) To establish methods for better and more efficient phosphate recovery mining and processing in this state as it may determine most beneficial to the economy, environment, and way of life of the citizens of the state.

(e) To enter into any mutually satisfactory contract with any firm, institution, corporation, or federal or state agency, as may be reasonably required or desired in carrying out the research and studies herein authorized.

(f) To make available to the public the results of its research program so that the research efforts will result in the public's being better informed as to the effects of phosphate mining in the state.

(g) To hold public hearings and consult with representatives of the phosphate industry and all other interested parties; to assign priorities for its research and studies; to make public from time to time its intentions as to future research and study; and to allocate its resources and personnel for such research and studies as it may determine from time to time to be in the public interest.

(h) To provide suitable and sufficient laboratory facilities and equipment, making use insofar as practical of the existing laboratory facilities and equipment of the State University System and other facilities as may be available, for carrying out the research and studies herein authorized.

(i) To administer the Phosphate Research Trust Fund and to expend funds therefrom for its administration and for carrying out the purposes set forth in this section. The Phosphate Research Trust Fund shall be subject to the service charge imposed pursuant to chapter 215.

(2) The institute may develop work products relating to research which is subject to trademark, copyright, or patent protection. Notwithstanding any law to the contrary, the institute may:

(a) Secure patents, copyrights, or trademarks on any of its work products and enforce its rights in such products. It shall consider contributions by Institute personnel, contractors, and grantees in the development of such products and shall enter in to written agreements with them establishing the interests of the respective parties in each patent, copyright, or trademark it secures.

(b) License, lease, or assign, or otherwise give consent to other persons for the manufacture or use of, work products it develops and receive royalties or other consideration for such use.

(c) Take any action necessary to protect its work products from improper or unlawful use or infringement.

(d) Collect any sums due it for the manufacture or use by any other person of such work products.

(e) Sell its interest in or rights to any work products it owns.

(f) Do all acts necessary to exercise its powers and perform its duties. Any action taken by the institute in securing or exploiting such patents, copyrights, or trademarks shall, within 30 days, be reported in writing to the Department of State. Any proceeds received by the institute under this subsection shall be deposited in the Phosphate Research Trust Fund for use as provided by law.

**(3)(a)** The institute may establish policies necessary to administer its research programs to assure their efficiency and effectiveness, producing the maximum benefit to the economy, environment, and residents of this state.

(b) Materials which relate to methods of manufacture or production, actual or potential trade secrets, patentable or potentially patentable materials, business transactions, or proprietary information pertaining to research conducted by or on behalf of the institute shall be confidential and exempt from the provisions of s. 110.07(1), except that the institute shall disclose upon request, the title and description of any research project, the researchers' names, and the amount and source of funding provided for such project. This exemption is subject to the Open Government Sunset Review Act in accordance with s. 119.14.

**(4)(a)** The work of the Florida Institute of Phosphate Research shall be directed by a five-member board of directors appointed by the Governor. The board shall be composed of one member from the faculty of a university within the State University System, one member from a major conservation group in this state, one member from state government, and two members from the phosphate mining or processing industry. The Governor shall make these appointments on the basis of their ability to set priorities for the phosphate research and otherwise give direction to a professional, efficient, and broad phosphate research effort. In setting such priorities, emphasis shall be given to applied research which tends to solve real problems of the industry in which the public has a substantial interest.

Members of the board of directors shall serve 3-year terms, or serve until successors are appointed; except that, of those members first appointed following October 1, 1983, one member shall be appointed for a term of 1 year; two members shall be appointed for terms of 2 years; and two members shall be appointed for terms of 3 years in order to achieve staggering of terms. A member of the board of directors shall be eligible for reappointment.

(c) A vacancy occurring other than by expiration of a term shall be filled by appropriate appointment for the remainder of the unexpired term in the same manner as the original appointment. However, no single vacancy in the board of directors shall impair the right of the remaining members to exercise the powers of the board of directors.

(d) The members of the board of directors shall select a chairman.

(e) The policies and decisions of the board shall be implemented through an executive director chosen by the board on the basis of professional competence, both scientific and administrative.

(f) The board shall adopt rules necessary to carry out the duties and responsibilities of the institute.

**378.102 Florida Institute of Phosphate Research;  
procurement of research services.--**

(1) SHORT TITLE.--This section may be cited as the "Florida Institute of Phosphate Research Competitive Negotiation Act."

(2) DEFINITIONS.--As used in this section, the term:

(a) "Research services" means services within the scope of research, as performed by a chemist, biologist, geologist, engineer, university professor, or other researcher in connection with research performed for the institute.

(b) "Institute" means the Florida Institute of Phosphate Research.

(c) "Firm" means any individual, firm, partnership, corporation, association, university, state or federal agency, or other legal entity permitted by law to enter into a contractual agreement for services in this state.

(d) "Compensation" means the total amount paid by the institute for research services.

(e) "Project" means the research study or planning activity described by the institute pursuant to paragraph (3)(a)

(f) "Selection committee" means a group composed of one or more of research directors of the institute and one or more outside experts, knowledgeable in the research subject to be addressed in the project. The committee shall consist of an odd number of at least three members selected by the board of directors of the institute.

**(3) PUBLIC ADVERTISEMENT AND QUALIFICATION**

PROCEDURE.--

(a) The institute shall publicly advertise, in a uniform and consistent manner, each occasion when research services are required to be purchased for a research project or for a research related planning or study activity and the fee for services exceeds \$5,000. The advertisement shall include a general description of the project and shall indicate how interested parties may apply for consideration.

(b) The institute shall adopt administrative procedures for the evaluation of research services, including, but not limited to, qualifications of the firm, capabilities, adequacy of personnel, plan of study, past record and experience, and any other factors applicable to the institute's requirements for a project.

(c) The proceedings under this section shall be open to the public.

**(4) COMPETITIVE SELECTION.--**

(a) A selection committee shall be chosen to evaluate current statements of qualifications and performance data on file with the institute, for each proposed project, with statements submitted by other firms regarding the proposed project, and shall conduct discussions with, and may require public presentations by, no fewer than three firms regarding their qualifications, approach to the project, and ability to furnish the required service. If three firms are not available, the board of directors may authorize consideration of fewer than three firms.

(b) The selection committee, considering the ability of research personnel; past performance; proposed plan of study; willingness to meet time and budget requirements; location; recent, current, and projected workloads; and the volume of work previously awarded to the firm by the institute, shall select in order of preference no fewer than three firms deemed to be most highly qualified to equitably distribute contracts among qualified firms, provided the most highly qualified firm with the most appropriate plan of study is selected. If fewer than three firms apply, the board of directors may consider the ones that apply.

(c) This subsection does not apply when the fee for professional services is \$5,000 or less.

**(5) COMPETITIVE NEGOTIATION.--**

(a) The institute shall negotiate a contract with the selected firm at compensation which is fair, competitive, and reasonable. In making such determination, the institute shall analyze the cost, scope, and complexity of the research services required. Fixed fee contracts must contain a provision stating that wage rates and other factual unit costs supporting the compensation are accurate, complete, and current at the time of contracting and must contain a provision that the original contract price and any additions will be adjusted to exclude any significant sums by which the institute determines the contract price was increased due to inaccurate, incomplete, or noncurrent wage rates and other factual unit costs. Contract adjustments must be made within 1 year following completion of a contract.

(b) If the institute is unable to negotiate a fair, competitive, and reasonable contract with the most qualified firm, negotiations with that firm shall be terminated and the institute shall negotiate with the second most qualified firm. If no agreement can be reached with the second most qualified firm, the institute shall terminate negotiations and shall negotiate with the third most qualified firm.

(c) If the institute is unable to negotiate a satisfactory contract with any of the selected firms, the institute shall select additional firms in order of competence and qualifications and shall continue negotiations until an agreement is reached, or the institute may readvertise or terminate the project.

**(6) PROHIBITION AGAINST CONTINGENT FEES.--**

(a) Each contract entered into by the institute for research services must contain the following provision: The researcher warrants that he has not employed or retained any person, other than an employee working only for him to secure this agreement and that he has not paid or agreed to pay any other person any consideration contingent upon the making of this agreement. If this provision is violated, the institute may terminate the agreement without liability and may deduct from the contract price, or otherwise recover, the full amount of such consideration from the researcher.

(b) Any person, other than an employee working only for a researcher, who offers, agrees, or contracts to solicit or secure institute contracts for any person other than the researcher and is to be paid, or is paid, any consideration contingent upon the award of a contract, is guilty of a misdemeanor of the first degree, punishable as provided in s. 775.082 or s. 775.083.

(c) Any person who offers to pay or pays any consideration contingent upon the award of any contract is guilty of a misdemeanor of the first degree, punishable as provided in s. 775.082 or s. 775.083.

(d) Any person employed by the institute who offers to solicit or solicits a contract for consideration contingent upon the award of such contract is guilty of a misdemeanor of the first degree, punishable as provided in s. 775.082 or s. 775.083.

**(7) APPLICABILITY TO EXISTING CONTRACTS.--** This section does not affect the validity or effect of any contracts in existence on October 1, 1986.