



**CPA2000-29
BoCC SPONSORED
AMENDMENT
TO THE**

LEE COUNTY COMPREHENSIVE PLAN

THE LEE PLAN

BoCC Adoption Document

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January 10, 2002

**LEE COUNTY
DIVISION OF PLANNING
STAFF REPORT FOR
COMPREHENSIVE PLAN AMENDMENT
CPA2000-29**

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Text Amendment

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Map Amendment

<input checked="" type="checkbox"/>	This Document Contains the Following Reviews:
<input checked="" type="checkbox"/>	Staff Review
<input checked="" type="checkbox"/>	Local Planning Agency Review and Recommendation
<input checked="" type="checkbox"/>	Board of County Commissioners Hearing for Transmittal
<input checked="" type="checkbox"/>	Staff Response to the DCA Objections, Recommendations, and Comments (ORC) Report
<input checked="" type="checkbox"/>	Board of County Commissioners Hearing for Adoption

STAFF REPORT PREPARATION DATE: February 19, 2001

PART I - BACKGROUND AND STAFF RECOMMENDATION

A. SUMMARY OF APPLICATION

1. APPLICANT:

LEE COUNTY BOARD OF COUNTY COMMISSIONERS
REPRESENTED BY LEE COUNTY DIVISION OF PLANNING

2. REQUEST:

Evaluate adding a definition for the term "Natural Resource Extraction" to the Lee Plan Glossary. In addition, amend the Future Land Use Element by adding the term "Natural Resource Extraction" to Goal 10 and its Objectives and Policies, where applicable, clarifying that natural resources other than minerals are subject to Goal 10 requirements.

B. STAFF RECOMMENDATION AND FINDINGS OF FACT SUMMARY:

1. RECOMMENDATION: Planning staff recommends that the Board of County Commissioners transmit the proposed amendment as provided under Part III.B., the Revised Staff Analysis & Recommended Language portion of this report.

2. BASIS AND RECOMMENDED FINDINGS OF FACT:

- A broader term for mineral extraction is needed to clarify that natural resources other than minerals are subject to Goal 10 requirements.
- Principal resources sought in Lee County are sand, gravel, limestone, oil and gas which include both organic and inorganic materials.
- It should be ensured that all mined materials, organic and inorganic, are included under the language of Goal 10.
- The improved term, "Natural Resource Extraction," should be placed in the Lee Plan Glossary to support the new term.

C. BACKGROUND INFORMATION

This amendment was initiated by the Board of County Commissioners on September 19, 2000. The amendment stems from a suggested improvement to the Lee Plan by an LPA member. This issue was brought up during a public hearing in which the upcoming amendment cycle was being discussed and suggestions taken. The proposal was for staff to evaluate Goal 10, Mineral Extraction, and its references to limerock. This member of the LPA noted that technically limerock is not a mineral, but is an organic material and suggested adding improved language such as a definition for natural resource extraction.

PART II - STAFF ANALYSIS

A. STAFF DISCUSSION

Goal 10 and its Objective and Policies address the extractive industry in Lee County and provides for the protection of natural resources, such as mineral resources, while limiting the potential adverse effects associated with the extraction of such resources. Goal 10, Objective 10.1, and the policies that follow are reproduced below:

GOAL 10: MINERAL EXTRACTION. *To protect areas containing identified mineral resources from incompatible urban development, while insuring that extraction operations minimize or eliminate adverse effects on surrounding land use and natural resources.*

OBJECTIVE 10.1: *Designate through the rezoning process sufficient lands suitable for providing fill material and limerock to meet the county's needs and to export to other communities, while providing adequate protection for the county's natural resources. (Amended by Ordinance No. 94-30)*

POLICY 10.1.1: *Mineral extraction operations intending to withdraw groundwater for any purpose must provide a monitoring system to measure groundwater impacts.*

POLICY 10.1.2: *Applications for mineral extraction permits for new or expanding areas must include an environmental assessment. The assessment will include (but not be limited to) consideration of air emissions, impact on environmental and natural resources, effect on nearby land uses, degradation of water quality, depletion of water quantity, drainage, fire and safety, noise, odor, visual impacts, transportation including access roads, sewage disposal, and solid waste disposal. (Amended by Ordinance No. 00-22)*

POLICY 10.1.3: *Applications for mineral extraction permits for new or expanding sites must include a reclamation plan which provides assurance of implementation. Reclamation plans in or near important groundwater resource areas must be designed to minimize the possibility of contamination of the groundwater during mining and after completion of the reclamation. (Amended by Ordinance No. 00-22)*

POLICY 10.1.4: *Mineral extraction activities (and industrial uses which are ancillary to mineral extraction) may be permitted in areas indicated on the Future Land Use Map as Rural, Open Lands, and Density Reduction/Groundwater Resources, provided they have adequate fire protection, transportation facilities, wastewater treatment and water supply, and provided further that they have no significant adverse effects such as dust and noise on surrounding land uses and natural resources. In order to reduce transport costs and minimize wear on the county's roadways, the extraction and transport of fill material may also be permitted as an interim use in the Future Urban Areas provided that the above requirements are met; however, special restrictions may also be applied to protect other land uses. These determinations will be made during the rezoning process. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 10.1.5: *Lee County will support efforts by government, community leaders, and the rock mining industry owners and businesses to seek incentives that will help to facilitate the connection of rock mining borrow lake excavations into a system of interconnected lakes and flowways that will enhance wildlife habitat values, provide for human recreation, educational and other appropriate uses, and/or strengthen community environmental benefits. (Added by Ordinance No. 99-15)*

The Goal provides specific language for the protection of mineral resources, the protection of surrounding land uses, reclamation, the prevention of the degradation of environmental resources and existing infrastructure, and provides language on the enhancement of the environment as an end result of extraction activities. The principal resources sought in Lee County, pertaining to the extraction industry, are sand, gravel, limestone, oil, and gas. These resources include both organic and inorganic materials according to the following two definitions of “mineral” and “limestone” taken from the Dictionary of Natural Resource Management (1996):

MINERAL *A non-technical word more specifically defined by legislation, usually involving one or more of the following: (1) a scientifically recognized inorganic material; (2) a material classified commercially as a mineral; (3) a material derived from the earth that possesses economic value and utility aside from the agricultural purposes of the land surface itself.*

Minerals include sand, gravel (common minerals), precious or semi-precious stones, coal, petroleum resources, and natural gas, even though the latter three are not inorganic. Some definitions limit the term to inorganic materials having a distinct chemical composition, characteristic crystalline structure, colour, and hardness.

LIMESTONE *A sedimentary rock consisting mainly (greater than 50 per cent) of calcium carbonate, typically as calcite. Limestone is formed by a combination of organic and inorganic processes and includes chemical and clastic (soluble and insoluble) constituents. Many forms of limestone contain fossils.*

Staff has evaluated Goal 10 and its Objectives and Policies, where applicable, and concur that a broader term for mineral extraction is needed to clarify that natural resources other than minerals are subject to Goal 10 requirements. Staff has evaluated the term *natural resource extraction* and also concurs that this would be the best term to ensure the inclusion of all materials, organic and inorganic, sought by the extractive industry. Throughout the language under Goal 10, mineral extraction, limerock, and rock mining are referenced.

Mining and fill dirt operations are required elements in a well balanced economy. Such operations provide fill allowing development to occur and provide raw materials for many other products. The proposed amendment will correct and bring all of the resources intended to be regulated under the Goal under unified terminology. Staff is proposing to add a definition of *natural resource extraction* to the Lee Plan Glossary.

In addition to the broader term and Glossary definition, staff is recommending that the term rock mining industry in Policy 10.1.5 be replaced with the term extractive industry. This will allow the language of the policy to include all types of mining. Staff is also recommending that Policy 1.1.7, Policy 1.4.5, and Policy 9.1.4 of the Future Land Use Element, which include references to mineral extraction, be amended to include the proposed term *natural resource extraction*.

B. CONCLUSIONS

Goal 10 and its Objectives and Policies give specific language in regards to extraction requirements yet refers only to mineral extraction. In light of the fact that limerock is a major resource found within the County but would not technically fall under the term "mineral" due to its organic properties, staff is proposing that the term *natural resource extraction* be adopted to replace the references to mineral extraction. Staff also proposes a definition in the Lee Plan Glossary to support the new term and also proposes the replacement of references to mineral extraction in Policy 1.1.7, Policy 1.4.5, and Policy 9.1.4 of the Future Land Use Element.

C. STAFF RECOMMENDATION

Planning staff recommends that the Board of County Commissioners transmit the proposed plan amendment. The proposed language is as follows.

GOAL 10: ~~MINERAL~~ NATURAL RESOURCE EXTRACTION. To protect areas containing identified ~~mineral~~ natural resources from incompatible urban development, while insuring that natural resource extraction operations minimize or eliminate adverse effects on surrounding land use and natural resources.

OBJECTIVE 10.1: Designate through the rezoning process sufficient lands suitable for providing fill material, and limerock, and other natural resource extraction materials to meet the county's needs and to export to other communities, while providing adequate protection for the county's natural resources. (Amended by Ordinance No. 94-30)

POLICY 10.1.1: ~~Mineral~~ Natural resource extraction operations intending to withdraw groundwater for any purpose must provide a monitoring system to measure groundwater impacts.

POLICY 10.1.2: Applications for ~~mineral~~ natural resource extraction permits for new or expanding areas must include an environmental assessment. The assessment will include (but not be limited to) consideration of air emissions, impact on environmental and natural resources, effect on nearby land uses, degradation of water quality, depletion of water quantity, drainage, fire and safety, noise, odor, visual impacts, transportation including access roads, sewage disposal, and solid waste disposal. (Amended by Ordinance No. 00-22)

POLICY 10.1.3: Applications for ~~mineral~~ natural resource extraction permits for new or expanding sites must include a reclamation plan which provides assurance of implementation. Reclamation plans in or near important groundwater resource areas must be designed to minimize the possibility of contamination of the groundwater during mining and after completion of the reclamation. (Amended by Ordinance No. 00-22)

POLICY 10.1.4: ~~Mineral~~ Natural resource extraction activities (and industrial uses which are ancillary to ~~mineral~~ natural resource extraction) may be permitted in areas indicated on the Future Land Use Map as Rural, Open Lands, and Density Reduction/Groundwater Resources, provided they have adequate fire protection, transportation facilities, wastewater treatment and water supply, and provided further that they have no significant adverse effects such as dust and noise on surrounding land uses and natural resources. In order to reduce transport costs and minimize wear on the county's roadways, the extraction and transport of fill material may also be permitted as an interim use in the Future Urban Areas provided that the above requirements are met; however, special restrictions may also be applied to protect other land uses. These determinations will be made during the rezoning process. (Amended by Ordinance No. 94-30, 00-22)

POLICY 10.1.5: Lee County will support efforts by government, community leaders, and the ~~rock mining~~ extractive industry owners and businesses to seek incentives that will help to facilitate the connection of ~~rock mining~~ natural resource extraction borrow lake excavations into a system of interconnected lakes and flowways that will enhance wildlife habitat values, provide for human recreation, educational and other appropriate uses, and/or strengthen community environmental benefits. (Added by Ordinance No. 99-15)

OBJECTIVE 10.2: Determine and maintain a balance between the County's petroleum resources and the health, safety and welfare of the residents of its Future Urban Areas. (Added by Ordinance No. 98-09)

POLICY 10.2.1: By 2000, the county will conduct a study to determine the appropriateness of oil exploration, drilling, or production. The study will address the issues of the compatibility of oil-related activities with the environment and urban uses. This study will include recommendations regarding the appropriateness of such activities within Lee County as well as guidelines under which such activities should be regulated under the Lee County Land Development Code. (Added by Ordinance No. 98-09, Amended by Ordinance No. 00-22)

Glossary Term:

NATURAL RESOURCE EXTRACTION - The act of extracting, through various techniques, renewable and non-renewable resources in their natural state on or below the surface of the earth.

Additional Policies:

POLICY 1.1.7: The Industrial Development areas play an important role in strengthening the county's economic base and will become increasingly important as the county grows in size and urban complexity. To a great extent these are the areas to which Lee County must look for expanded job opportunities, investments and production opportunities, and a balanced and sufficient tax base. These areas have special locational requirements that are more stringent than those for residential areas, including transportation needs (e.g., air, rail, highway); industrial levels of water, sewer, fire protection, and other urban services; and locations that are convenient for employees to reach. Whereas the other Future Urban Areas will include a broad combination of residential, commercial, public, and limited industrial land uses, the Industrial Development area is to be reserved mainly for industrial activities per se, as well as for selective land use mixtures such as the combined uses of industrial, manufacturing, research, properly buffered recreational uses (except where precluded by airport hazard zone regulations), and office complexes (if specifically related to adjoining industrial uses) that constitute a growing part of Florida's economic development sector. New ~~mineral~~ natural resource extraction (mining) activities and fill dirt operations must be approved through the Industrial Planned Development rezoning process. Retail or wholesale of products manufactured or processed upon the premises may be allowed at a ratio of 1 square foot of commercial uses to 10 square feet of industrial use in association with a Planned Development. Ancillary minor retail commercial uses intended to support the surrounding industrial land uses may not exceed 30,000 square feet per development; and, at buildout, may not exceed more than ten percent (10%) of the total acreage of the lands designated as Industrial Development areas in each community outlined in Map

16. Residential uses, other than bona fide caretaker residences, are not permitted in this category except to the extent provided in Chapter XIII of the Plan. (Amended by Ordinance No. 94-30, 98-09, 99-15)

POLICY 1.4.5: The Density Reduction/Groundwater Resource (DR/GR) areas include upland areas that provide substantial recharge to aquifers most suitable for future wellfield development. These areas also are the most favorable locations for physical withdrawal of water from those aquifers. Only minimal public facilities exist or are programmed. Land uses in these areas must be compatible with maintaining surface and groundwater levels at their historic levels. Permitted land uses include agriculture, ~~mineral or limestone~~ natural resource extraction and related facilities, conservation uses, publicly-owned gun range facilities, private recreation facilities, and residential uses at a maximum density of one dwelling unit per ten acres (1 du/10 acres). Individual residential parcels may contain up to two acres of Wetlands without losing the right to have a dwelling unit, provided that no alterations are made to those wetland areas. (Amended by Ordinance 91-19, 94-30, 99-16)

POLICY 9.1.4: Protect agricultural activities on lands designated as Agricultural on the agricultural overlay from the impacts of new ~~mineral~~ natural resource extraction operations, recreational uses, and residential developments. (Amended by Ordinance No. 94-30)

PART III - LOCAL PLANNING AGENCY REVIEW AND RECOMMENDATION

DATE OF PUBLIC HEARING: February 26, 2001

A. LOCAL PLANNING AGENCY REVIEW

Staff presented this amendment before the LPA on February 26, 2001. After some discussion the LPA voted to continue the amendment. One member of the LPA asked for examples of materials that would fall under the definition. Staff noted that sand, gravel, limestone, oil, and gas are some of the most sought out resources in the county. Another member noted there are other materials sought after and suggested staff add language to the glossary term providing examples but not limiting the term to only these materials. Another member of the LPA noted that the glossary term should not be defined with the same words used within the term (extraction) and suggested this be changed. Another member of the LPA questioned if water had been given proper consideration with the proposed changes, due to the fact that water is also a natural resource. A motion was called and carried to continue the amendment until water can be reviewed and given adequate consideration under the context of the proposed amendment.

B. REVISED STAFF ANALYSIS & RECOMMENDED LANGUAGE

Staff has evaluated the concerns of the LPA and offer the revised language provided below. In order to address the word *extraction* within the proposed glossary term staff has replaced it with the word *removing*. According to Black's Law Dictionary the word *removal* is defined as follows:

Removal - In a broad sense, the transfer of a person, thing, or case from one place to another.

In this case the word would be relating to the transfer of a thing, a natural resource, from one place to another. Staff finds that the word *removing* would be a clear and concise word to be included in the glossary term, replacing the word *extraction*.

Staff has also reviewed water under the context of the amendment. There are sufficient safeguards contained within the Lee Plan, the County's plan amendment application, and the Land Development Code in addition to South Florida Water Management District rules protecting and regulating water supply. In addition, after discussions with Lee County Natural Resource staff, it is commonly perceived that the removal of water is considered in conjunction with the term withdrawal, rather than the term extraction.

Lee Plan

The Lee Plan provides language addressing critical areas for future water supply, the protection of such critical areas, the staff appointed for reviewing proposed development near public utility wellfields, coordination with and criteria set forth by the SFWMD, identifying water pollutant sources, identifying water needs, inspections, the wellfield protection ordinance, and avoidance of premature urbanization. Following are the Goals, Objectives, and Policies from the Future Land Use, Community Facilities and Services, Conservation and Coastal Management, and Housing elements of the Lee Plan which provide the language noted above:

***POLICY 2.4.2:** All proposed changes to the Future Land Use Map in critical areas for future potable water supply (Bonita Springs as described in Policy 13.2.2; Lehigh Acres as described in Policy 34.1.9; and all land in the Density Reduction/ Groundwater Resource land use category) will be subject to a special review by the staff of Lee County. This review will analyze the proposed land uses to determine the short-term and long-term availability of irrigation and domestic water sources, and will assess whether the proposed land uses would cause any significant*

impact on present or future water resources. If the Board of County Commissioners wishes to approve any such changes to the Future Land Use Map, it must make a formal finding that no significant impacts on present or future water resources will result from the change. (Amended by Ordinance No. 92-47) (Amended by Ordinance No. 94-30, 00-22)

POLICY 2.4.3: Future Land Use Map Amendments to the existing DR/GR areas south of SR 82 east of I-75, excluding areas designated by the Port Authority as needed for airport expansion, which increase the current allowable density or intensity of land use will be discouraged by the county. It is Lee County's policy not to approve further urban designations there for the same reasons that supported its 1990 decision to establish this category. In addition to satisfying the requirements in 163 Part II Florida Statutes, Rule 9J-5 of the Florida Administrative Code, the Strategic Regional Policy Plan, the State Comprehensive Plan, and all of the criteria in the Lee Plan, applicants seeking such an amendment must:

1. analyze the proposed allowable land uses to determine the availability of irrigation and domestic water sources; and,
2. identify potential irrigation and domestic water sources, consistent with the Regional Water Supply Plan. Since regional water suppliers cannot obtain permits consistent with the planning time frame of the Lee Plan, water sources do not have to be currently permitted and available, but they must be reasonably capable of being permitted; and,
3. present data and analysis that the proposed land uses will not cause any significant harm to present and future public water resources; and,
4. supply data and analysis specifically addressing the urban sprawl criteria listed in Rule 9J-5.006(5) (g), (h), (i) and (j), FAC.

During the transmittal and adoption process, the Board of County Commissioners must review the application for all these analytical requirements and make a finding that the amendment complies with all of them. (Added by Ordinance No. 97-05)

POLICY 13.2.2: IRRIGATION WELLS. Bonita Springs (as defined in this plan) is hereby declared a critical area for future potable water supply, based on evidence that withdrawals from the main potable aquifer, the lower Tamiami aquifer, are approaching or exceeding the maximum safe yield. In response to this designation, the county will maintain current regulations to provide that new irrigation well permits in Bonita Springs may not utilize the main potable water source. (Also see Policy 34.1.9 for new permit requirements for wells in Lehigh Acres, and Policy 2.4.2 for special requirements for amendments to the Future Land Use Map.) (Amended by Ordinance No. 94-30, 00-22)

POLICY 16.4.8: If a proposed Private Recreation Facilities falls within an area identified as anticipated drawdown zone for existing or future public well development, the project must utilize an alternative water supply such as reuse or withdrawal from a different non-competing aquifer or show that adequate supply is available in excess of that being used for planned public water supply development. (Added by Ordinance No. 99-16)

POLICY 35.1.2: The Lee County Regional Water Supply Authority will plan and coordinate with all member governments in the development of comprehensive plans as they relate to wellfield protection, aquifer recharge, water supply, and related capital facilities. (Added by Ordinance No. 00-22)

POLICY 35.1.3: The Lee County Regional Water Supply Authority will perform groundwater modeling and analysis for new development, as requested by the member governments, to assess the potential impact on the water resources of member governments. The analysis will focus on the following issues:

- Adequacy of water supply, including groundwater level draw-down
- Avoidance of adverse impacts on natural systems from water supply withdrawals.

(Added by Ordinance No. 00-22)

e. Groundwater Recharge

GOAL 43: GROUNDWATER. *To protect the county's groundwater supplies from those activities having the potential for depleting or degrading those supplies.*

OBJECTIVE 43.1: WELLFIELD PROTECTION. *The county will maintain a wellfield protection ordinance to provide regulations protecting the quality of water flowing into potable water wellfields. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 43.1.1: *The wellfield protection ordinance will be amended whenever better technical data is developed and whenever additional potable wellfields are proposed. (Amended by Ordinance No. 00-22)*

POLICY 43.1.2: *The staff hydrogeologist will review and comment on all development applications near public utility potable water wellfields, with particular attention to proposed land uses within a 10-year travel time from the wellheads. (Amended by Ordinance No. 00-22)*

OBJECTIVE 43.2: POTABLE GROUNDWATER. *Base all future development and use of groundwater resources on determinations of the safe yield of the aquifer system(s) in order not to impair the native groundwater quality or create other environmental damage. Criteria for safe-yield determinations will be determined by the SFWMD, the agency charged with permitting these activities. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 43.2.1: *For maximum protection of groundwater resources, identify future wellfields and/or relocation site(s) for existing wellfields well in advance of need. Coordinate with SFWMD, other water suppliers, and DEP to avoid duplication and to assist in data collection and interchange. (Amended by Ordinance No. 94-30)*

POLICY 43.2.2: *Institute a program to identify sources of groundwater pollutants in Lee County and to map these (point and non-point) on a county-wide basis.*

POLICY 43.2.3: *Identify water needs consistent with projections of human population and the needs of natural systems in order to determine the future demands for groundwater. (Amended by Ordinance No. 94-30)*

POLICY 43.2.4: *Expand current programs to identify and map the contamination potential of groundwater resources for those areas of Lee County not currently under public ownership.*

POLICY 43.2.5: *Lee County, in cooperation with other agencies and the municipalities, will budget to maintain its current program of plugging non- valved, abandoned, or improperly-cased artesian wells so that at least seventy-five of these wells are plugged each year until such wells are eliminated. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 85.1.7: *Valid permits and inspection shall be required prior and subsequent to drilling operations for wells, elevator shafts, foundation holes, and test borings.*

POLICY 85.1.8: *The county shall continue its program of plugging improperly constructed wells which are detrimental to groundwater resources. (Amended by Ordinance No. 94-30)*

POLICY 100.9.7: *The county shall coordinate residential development within urban areas to coincide with existing or planned and programmed services and facilities so as to avoid premature or non-contiguous urbanization and the use of septic tanks and private wells for potable water within developed urban areas.*

Plan Amendment Application

Lee County's application for a comprehensive plan amendment requests various forms of support documentation under Part IV of the application. Section F of Part IV provides for additional requirements for specific amendments. Under this section #3 requires requests involving lands in critical areas be evaluated based on Policy 2.4.2. Part IV.F.3. is reproduced below:

3. Requests involving lands in critical areas for future water supply must be evaluated based on policy 2.4.2.

Wellfield Protection Ordinance

The wellfield protection ordinance (Ordinance No. 95-01) was adopted by the Lee County Board of County Commissioners in 1995 and is located under Article III, Section 14-201 through 14-258 of the Land Development Code. The intent of the article, under Section 14-202(b), is reproduced below:

b) The intent of this article is further to safeguard the public health, safety and welfare of the residents of the county by providing criteria for the regulation of activities which may allow the entrance of brackish water into identified protection zones surrounding existing wellfields, and prohibiting or regulating hazardous or toxic substances within identified protection zones surrounding such wellfields, thereby protecting existing public potable water supply wells from contamination. The provisions of this article apply only to the unincorporated areas of the county.

The article establishes and defines four types of wellfield protection zones and adopts protection zone maps. Under Section 14-214, titled *prohibited and regulated activities within protection zones*, earth mining within a 500-foot radius of an existing wellhead is prohibited. Also under this section of the article all protection zones, 1 through 4, are regulated that any stormwater or surface water discharge within the zones will conform to existing South Florida Water Management District and State Department of Environmental Protection rules.

Staff has reviewed and evaluated the natural resource water under the context of the proposed amendment and has determined that there is significant documentation regarding the protection and regulation of this natural resource. All of the County's regulating documents discussed above in addition to the South Florida Water Management Districts regulations, provide standards and prohibitions on the withdrawal of groundwater and the impacts of development and activities on the County's water resources. Staff has concluded that although water is a natural resource the proposed glossary term should exclude this natural resource due to the fact that it is adequately addressed through other regulations and the fact that Goal 10 and its Objectives and Policies primarily concentrate on the extraction of materials, rather than the withdrawal of groundwater.

The revised language to the Glossary term is as follows. No other changes have been made to the initial proposal also shown below. New changes to the proposed term are shown in strike through and double underlining.

Glossary Term:

NATURAL RESOURCE EXTRACTION - The act of ~~extracting removing~~, through various techniques, renewable and non-renewable resources, excluding water, in their natural state on or below the surface of the earth. Such resources include but are not limited to sand, gravel, limestone, fill dirt, oil, and natural gas.

GOAL 10: ~~MINERAL~~ NATURAL RESOURCE EXTRACTION. To protect areas containing identified ~~mineral~~ natural resources from incompatible urban development, while insuring that natural resource extraction operations minimize or eliminate adverse effects on surrounding land use and natural resources.

OBJECTIVE 10.1: Designate through the rezoning process sufficient lands suitable for providing fill material, ~~and~~ limerock, and other natural resource extraction materials to meet the county's needs and to export to other communities, while providing adequate protection for the county's natural resources. (Amended by Ordinance No. 94-30)

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POLICY 10.1.5: Lee County will support efforts by government, community leaders, and the ~~rock mining extractive~~ industry owners and businesses to seek incentives that will help to facilitate the connection of ~~rock mining~~ natural resource extraction borrow lake excavations into a system of interconnected lakes and flowways that will enhance wildlife habitat values, provide for human recreation, educational and other appropriate uses, and/or strengthen community environmental benefits. (Added by Ordinance No. 99-15)

OBJECTIVE 10.2: Determine and maintain a balance between the County's petroleum resources and the health, safety and welfare of the residents of its Future Urban Areas. (Added by Ordinance No. 98-09)

POLICY 10.2.1: By 2000, the county will conduct a study to determine the appropriateness of oil exploration, drilling, or production. The study will address the issues of the compatibility of oil-related activities with the environment and urban uses. This study will include recommendations regarding the appropriateness of such activities within Lee County as well as guidelines under which such activities should be regulated under the Lee County Land Development Code. (Added by Ordinance No. 98-09, Amended by Ordinance No. 00-22)

Additional Policies:

POLICY 1.1.7: The Industrial Development areas play an important role in strengthening the county's economic base and will become increasingly important as the county grows in size and urban complexity. To a great extent these are the areas to which Lee County must look for expanded job opportunities, investments and production opportunities, and a balanced and sufficient tax base. These areas have special locational requirements that are more stringent than those for residential areas, including transportation needs (e.g., air, rail, highway); industrial levels of water, sewer, fire protection, and other urban services; and locations that are convenient for employees to reach. Whereas the other Future Urban Areas will include a broad combination of residential, commercial, public, and limited industrial land uses, the Industrial Development area is to be reserved mainly for industrial activities per se, as well as for selective land use mixtures such as the combined uses of industrial, manufacturing, research, properly buffered recreational uses (except where precluded by airport hazard zone regulations), and office complexes (if specifically related to adjoining industrial uses) that constitute a growing part of Florida's economic development sector. New ~~mineral~~ natural resource extraction (mining) activities and fill dirt operations must be approved through the Industrial Planned Development rezoning process. Retail or wholesale of products manufactured or processed upon the premises may be allowed at a ratio of 1 square foot of commercial uses to 10 square feet of industrial use in association with a Planned Development. Ancillary minor retail commercial uses intended to support the surrounding industrial land uses may not exceed 30,000 square feet per development; and, at buildout, may not exceed more than ten percent (10%) of the total acreage of the lands designated as Industrial Development areas in each community outlined in Map 16. Residential uses, other than bona fide caretaker residences, are not permitted in this category except to the extent provided in Chapter XIII of the Plan. (Amended by Ordinance No. 94-30, 98-09, 99-15)

POLICY 1.4.5: The Density Reduction/Groundwater Resource (DR/GR) areas include upland areas that provide substantial recharge to aquifers most suitable for future wellfield development. These areas also are the most favorable locations for physical withdrawal of water from those aquifers. Only minimal public facilities exist or are programmed. Land uses in these areas must be compatible with maintaining surface and groundwater levels at their historic levels. Permitted land uses include agriculture, ~~mineral or limestone~~ natural resource extraction and related facilities, conservation uses, publicly-owned gun range facilities, private recreation facilities, and residential uses at a maximum density of one dwelling unit per ten acres (1 du/10 acres). Individual residential parcels may contain up to two acres of Wetlands without losing the right to have a dwelling unit, provided that no alterations are made to those wetland areas. (Amended by Ordinance 91-19, 94-30, 99-16)

POLICY 9.1.4: Protect agricultural activities on lands designated as Agricultural on the agricultural overlay from the impacts of new ~~mineral~~ natural resource extraction operations, recreational uses, and residential developments. (Amended by Ordinance No. 94-30)

**LOCAL PLANNING AGENCY
REVIEW AND RECOMMENDATION**

DATE OF PUBLIC HEARING: March 26, 2001

C. LOCAL PLANNING AGENCY REVIEW

Staff presented this amendment before the LPA on March 26, 2001. Staff clarified the changes made to the proposed language since it had been presented before the LPA in February. The LPA provided no discussion concerning the proposed amendment.

D. LOCAL PLANNING AGENCY RECOMMENDATION AND FINDINGS OF FACT SUMMARY

1. **RECOMMENDATION:** The LPA recommends that the Board of County Commissioners transmit this amendment.
2. **BASIS AND RECOMMENDED FINDINGS OF FACT:** The LPA accepted the findings of fact as advanced by the staff.

E. VOTE:

NOEL ANDRESS	_____ AYE
SUSAN BROOKMAN	_____ AYE
BARRY ERNST	_____ AYE
RONALD INGE	_____ AYE
GORDON REIGELMAN	_____ AYE
VIRGINIA SPLITT	_____ ABSENT
GREG STUART	_____ AYE

**PART IV - BOARD OF COUNTY COMMISSIONERS
HEARING FOR TRANSMITTAL OF PROPOSED AMENDMENT**

DATE OF TRANSMITTAL HEARING: August 29, 2001

A. BOARD REVIEW: The Board of County Commissioners provided no discussion concerning the proposed plan amendment. This item was approved on the consent agenda.

B. BOARD ACTION AND FINDINGS OF FACT SUMMARY:

1. **BOARD ACTION:** The Board of County Commissioners voted to transmit the proposed plan amendment.
2. **BASIS AND RECOMMENDED FINDINGS OF FACT:** The Board accepted the findings of fact advanced by staff and the LPA.

C. VOTE:

JOHN ALBION

AYE

ANDREW COY

AYE

BOB JANES

AYE

RAY JUDAH

AYE

DOUG ST. CERNY

AYE

**PART V - DEPARTMENT OF COMMUNITY AFFAIRS OBJECTIONS,
RECOMMENDATIONS, AND COMMENTS (ORC) REPORT**

DATE OF ORC REPORT: November 21, 2001

A. DCA OBJECTIONS, RECOMMENDATIONS AND COMMENTS

The DCA had no objections, recommendations, or comments concerning this amendment.

B. STAFF RECOMMENDATION

Adopt the amendment as transmitted.

**PART VI - BOARD OF COUNTY COMMISSIONERS
HEARING FOR ADOPTION OF PROPOSED AMENDMENT**

DATE OF ADOPTION HEARING: January 10, 2002

A. BOARD REVIEW: The Board provided no discussion on this amendment. This item was approved on the consent agenda.

B. BOARD ACTION AND FINDINGS OF FACT SUMMARY:

- 1. BOARD ACTION:** The Board voted to adopt the amendment.
- 2. BASIS AND RECOMMENDED FINDINGS OF FACT:** The Board accepted the findings of fact as advanced by staff.

C. VOTE:

JOHN ALBION

AYE

ANDREW COY

ABSENT

BOB JANES

AYE

RAY JUDAH

AYE

DOUG ST. CERNY

AYE

**CPA2000-29
BoCC SPONSORED
AMENDMENT
TO THE**

LEE COUNTY COMPREHENSIVE PLAN

THE LEE PLAN

BoCC Public Hearing Document
for the
January 10th Adoption Hearing

*Lee County Planning Division
1500 Monroe Street
P.O. Box 398
Fort Myers, FL 33902-0398
(941) 479-8585*

November 21, 2001

**LEE COUNTY
DIVISION OF PLANNING
STAFF REPORT FOR
COMPREHENSIVE PLAN AMENDMENT
CPA2000-29**

☒

Text Amendment

☐

Map Amendment

✓	This Document Contains the Following Reviews:
✓	Staff Review
✓	Local Planning Agency Review and Recommendation
✓	Board of County Commissioners Hearing for Transmittal
✓	Staff Response to the DCA Objections, Recommendations, and Comments (ORC) Report
	Board of County Commissioners Hearing for Adoption

STAFF REPORT PREPARATION DATE: February 19, 2001

PART I - BACKGROUND AND STAFF RECOMMENDATION

A. SUMMARY OF APPLICATION

1. APPLICANT:

LEE COUNTY BOARD OF COUNTY COMMISSIONERS
REPRESENTED BY LEE COUNTY DIVISION OF PLANNING

2. REQUEST:

Evaluate adding a definition for the term "Natural Resource Extraction" to the Lee Plan Glossary. In addition, amend the Future Land Use Element by adding the term "Natural Resource Extraction" to Goal 10 and its Objectives and Policies, where applicable, clarifying that natural resources other than minerals are subject to Goal 10 requirements.

B. STAFF RECOMMENDATION AND FINDINGS OF FACT SUMMARY:

1. RECOMMENDATION: Planning staff recommends that the Board of County Commissioners transmit the proposed amendment as provided under Part III.B., the Revised Staff Analysis & Recommended Language portion of this report.

2. BASIS AND RECOMMENDED FINDINGS OF FACT:

- A broader term for mineral extraction is needed to clarify that natural resources other than minerals are subject to Goal 10 requirements.
- Principal resources sought in Lee County are sand, gravel, limestone, oil and gas which include both organic and inorganic materials.
- It should be ensured that all mined materials, organic and inorganic, are included under the language of Goal 10.
- The improved term, "Natural Resource Extraction," should be placed in the Lee Plan Glossary to support the new term.

C. BACKGROUND INFORMATION

This amendment was initiated by the Board of County Commissioners on September 19, 2000. The amendment stems from a suggested improvement to the Lee Plan by an LPA member. This issue was brought up during a public hearing in which the upcoming amendment cycle was being discussed and suggestions taken. The proposal was for staff to evaluate Goal 10, Mineral Extraction, and its references to limerock. This member of the LPA noted that technically limerock is not a mineral, but is an organic material and suggested adding improved language such as a definition for natural resource extraction.

PART II - STAFF ANALYSIS

A. STAFF DISCUSSION

Goal 10 and its Objective and Policies address the extractive industry in Lee County and provides for the protection of natural resources, such as mineral resources, while limiting the potential adverse effects associated with the extraction of such resources. Goal 10, Objective 10.1, and the policies that follow are reproduced below:

GOAL 10: MINERAL EXTRACTION. *To protect areas containing identified mineral resources from incompatible urban development, while insuring that extraction operations minimize or eliminate adverse effects on surrounding land use and natural resources.*

OBJECTIVE 10.1: *Designate through the rezoning process sufficient lands suitable for providing fill material and limerock to meet the county's needs and to export to other communities, while providing adequate protection for the county's natural resources. (Amended by Ordinance No. 94-30)*

POLICY 10.1.1: *Mineral extraction operations intending to withdraw groundwater for any purpose must provide a monitoring system to measure groundwater impacts.*

POLICY 10.1.2: *Applications for mineral extraction permits for new or expanding areas must include an environmental assessment. The assessment will include (but not be limited to) consideration of air emissions, impact on environmental and natural resources, effect on nearby land uses, degradation of water quality, depletion of water quantity, drainage, fire and safety, noise, odor, visual impacts, transportation including access roads, sewage disposal, and solid waste disposal. (Amended by Ordinance No. 00-22)*

POLICY 10.1.3: *Applications for mineral extraction permits for new or expanding sites must include a reclamation plan which provides assurance of implementation. Reclamation plans in or near important groundwater resource areas must be designed to minimize the possibility of contamination of the groundwater during mining and after completion of the reclamation. (Amended by Ordinance No. 00-22)*

POLICY 10.1.4: *Mineral extraction activities (and industrial uses which are ancillary to mineral extraction) may be permitted in areas indicated on the Future Land Use Map as Rural, Open Lands, and Density Reduction/Groundwater Resources, provided they have adequate fire protection, transportation facilities, wastewater treatment and water supply, and provided further that they have no significant adverse effects such as dust and noise on surrounding land uses and natural resources. In order to reduce transport costs and minimize wear on the county's roadways, the extraction and transport of fill material may also be permitted as an interim use in the Future Urban Areas provided that the above requirements are met; however, special restrictions may also be applied to protect other land uses. These determinations will be made during the rezoning process. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 10.1.5: *Lee County will support efforts by government, community leaders, and the rock mining industry owners and businesses to seek incentives that will help to facilitate the connection of rock mining borrow lake excavations into a system of interconnected lakes and flowways that will enhance wildlife habitat values, provide for human recreation, educational and other appropriate uses, and/or strengthen community environmental benefits. (Added by Ordinance No. 99-15)*

The Goal provides specific language for the protection of mineral resources, the protection of surrounding land uses, reclamation, the prevention of the degradation of environmental resources and existing infrastructure, and provides language on the enhancement of the environment as an end result of extraction activities. The principal resources sought in Lee County, pertaining to the extraction industry, are sand, gravel, limestone, oil, and gas. These resources include both organic and inorganic materials according to the following two definitions of "mineral" and "limestone" taken from the Dictionary of Natural Resource Management (1996):

MINERAL *A non-technical word more specifically defined by legislation, usually involving one or more of the following: (1) a scientifically recognized inorganic material; (2) a material classified commercially as a mineral; (3) a material derived from the earth that possesses economic value and utility aside from the agricultural purposes of the land surface itself.*

Minerals include sand, gravel (common minerals), precious or semi-precious stones, coal, petroleum resources, and natural gas, even though the latter three are not inorganic. Some definitions limit the term to inorganic materials having a distinct chemical composition, characteristic crystalline structure, colour, and hardness.

LIMESTONE *A sedimentary rock consisting mainly (greater than 50 per cent) of calcium carbonate, typically as calcite. Limestone is formed by a combination of organic and inorganic processes and includes chemical and clastic (soluble and insoluble) constituents. Many forms of limestone contain fossils.*

Staff has evaluated Goal 10 and its Objectives and Policies, where applicable, and concur that a broader term for mineral extraction is needed to clarify that natural resources other than minerals are subject to Goal 10 requirements. Staff has evaluated the term *natural resource extraction* and also concurs that this would be the best term to ensure the inclusion of all materials, organic and inorganic, sought by the extractive industry. Throughout the language under Goal 10, mineral extraction, limerock, and rock mining are referenced.

Mining and fill dirt operations are required elements in a well balanced economy. Such operations provide fill allowing development to occur and provide raw materials for many other products. The proposed amendment will correct and bring all of the resources intended to be regulated under the Goal under unified terminology. Staff is proposing to add a definition of *natural resource extraction* to the Lee Plan Glossary.

In addition to the broader term and Glossary definition, staff is recommending that the term rock mining industry in Policy 10.1.5 be replaced with the term extractive industry. This will allow the language of the policy to include all types of mining. Staff is also recommending that Policy 1.1.7, Policy 1.4.5, and Policy 9.1.4 of the Future Land Use Element, which include references to mineral extraction, be amended to include the proposed term *natural resource extraction*.

B. CONCLUSIONS

Goal 10 and its Objectives and Policies give specific language in regards to extraction requirements yet refers only to mineral extraction. In light of the fact that limerock is a major resource found within the County but would not technically fall under the term "mineral" due to its organic properties, staff is proposing that the term *natural resource extraction* be adopted to replace the references to mineral extraction. Staff also proposes a definition in the Lee Plan Glossary to support the new term and also proposes the replacement of references to mineral extraction in Policy 1.1.7, Policy 1.4.5, and Policy 9.1.4 of the Future Land Use Element.

C. STAFF RECOMMENDATION

Planning staff recommends that the Board of County Commissioners transmit the proposed plan amendment. The proposed language is as follows.

GOAL 10: ~~MINERAL~~ NATURAL RESOURCE EXTRACTION. To protect areas containing identified ~~mineral~~ natural resources from incompatible urban development, while insuring that natural resource extraction operations minimize or eliminate adverse effects on surrounding land use and natural resources.

OBJECTIVE 10.1: Designate through the rezoning process sufficient lands suitable for providing fill material, and limerock, and other natural resource extraction materials to meet the county's needs and to export to other communities, while providing adequate protection for the county's natural resources. (Amended by Ordinance No. 94-30)

POLICY 10.1.1: ~~Mineral~~ Natural resource extraction operations intending to withdraw groundwater for any purpose must provide a monitoring system to measure groundwater impacts.

POLICY 10.1.2: Applications for ~~mineral~~ natural resource extraction permits for new or expanding areas must include an environmental assessment. The assessment will include (but not be limited to) consideration of air emissions, impact on environmental and natural resources, effect on nearby land uses, degradation of water quality, depletion of water quantity, drainage, fire and safety, noise, odor, visual impacts, transportation including access roads, sewage disposal, and solid waste disposal. (Amended by Ordinance No. 00-22)

POLICY 10.1.3: Applications for ~~mineral~~ natural resource extraction permits for new or expanding sites must include a reclamation plan which provides assurance of implementation. Reclamation plans in or near important groundwater resource areas must be designed to minimize the possibility of contamination of the groundwater during mining and after completion of the reclamation. (Amended by Ordinance No. 00-22)

POLICY 10.1.4: ~~Mineral~~ Natural resource extraction activities (and industrial uses which are ancillary to ~~mineral~~ natural resource extraction) may be permitted in areas indicated on the Future Land Use Map as Rural, Open Lands, and Density Reduction/Groundwater Resources, provided they have adequate fire protection, transportation facilities, wastewater treatment and water supply, and provided further that they have no significant adverse effects such as dust and noise on surrounding land uses and natural resources. In order to reduce transport costs and minimize wear on the county's roadways, the extraction and transport of fill material may also be permitted as an interim use in the Future Urban Areas provided that the above requirements are met; however, special restrictions may also be applied to protect other land uses. These determinations will be made during the rezoning process. (Amended by Ordinance No. 94-30, 00-22)

POLICY 10.1.5: Lee County will support efforts by government, community leaders, and the ~~rock mining~~ extractive industry owners and businesses to seek incentives that will help to facilitate the connection of ~~rock mining~~ natural resource extraction borrow lake excavations into a system of interconnected lakes and flowways that will enhance wildlife habitat values, provide for human recreation, educational and other appropriate uses, and/or strengthen community environmental benefits. (Added by Ordinance No. 99-15)

OBJECTIVE 10.2: Determine and maintain a balance between the County's petroleum resources and the health, safety and welfare of the residents of its Future Urban Areas. (Added by Ordinance No. 98-09)

POLICY 10.2.1: By 2000, the county will conduct a study to determine the appropriateness of oil exploration, drilling, or production. The study will address the issues of the compatibility of oil-related activities with the environment and urban uses. This study will include recommendations regarding the appropriateness of such activities within Lee County as well as guidelines under which such activities should be regulated under the Lee County Land Development Code. (Added by Ordinance No. 98-09, Amended by Ordinance No. 00-22)

Glossary Term:

NATURAL RESOURCE EXTRACTION - The act of extracting, through various techniques, renewable and non-renewable resources in their natural state on or below the surface of the earth.

Additional Policies:

POLICY 1.1.7: The Industrial Development areas play an important role in strengthening the county's economic base and will become increasingly important as the county grows in size and urban complexity. To a great extent these are the areas to which Lee County must look for expanded job opportunities, investments and production opportunities, and a balanced and sufficient tax base. These areas have special locational requirements that are more stringent than those for residential areas, including transportation needs (e.g., air, rail, highway); industrial levels of water, sewer, fire protection, and other urban services; and locations that are convenient for employees to reach. Whereas the other Future Urban Areas will include a broad combination of residential, commercial, public, and limited industrial land uses, the Industrial Development area is to be reserved mainly for industrial activities per se, as well as for selective land use mixtures such as the combined uses of industrial, manufacturing, research, properly buffered recreational uses (except where precluded by airport hazard zone regulations), and office complexes (if specifically related to adjoining industrial uses) that constitute a growing part of Florida's economic development sector. New ~~mineral~~ natural resource extraction (mining) activities and fill dirt operations must be approved through the Industrial Planned Development rezoning process. Retail or wholesale of products manufactured or processed upon the premises may be allowed at a ratio of 1 square foot of commercial uses to 10 square feet of industrial use in association with a Planned Development. Ancillary minor retail commercial uses intended to support the surrounding industrial land uses may not exceed 30,000 square feet per development; and, at buildout, may not exceed more than ten percent (10%) of the total acreage of the lands designated as Industrial Development areas in each community outlined in Map

16. Residential uses, other than bona fide caretaker residences, are not permitted in this category except to the extent provided in Chapter XIII of the Plan. (Amended by Ordinance No. 94-30, 98-09, 99-15)

POLICY 1.4.5: The Density Reduction/Groundwater Resource (DR/GR) areas include upland areas that provide substantial recharge to aquifers most suitable for future wellfield development. These areas also are the most favorable locations for physical withdrawal of water from those aquifers. Only minimal public facilities exist or are programmed. Land uses in these areas must be compatible with maintaining surface and groundwater levels at their historic levels. Permitted land uses include agriculture, ~~mineral or limestone~~ natural resource extraction and related facilities, conservation uses, publicly-owned gun range facilities, private recreation facilities, and residential uses at a maximum density of one dwelling unit per ten acres (1 du/10 acres). Individual residential parcels may contain up to two acres of Wetlands without losing the right to have a dwelling unit, provided that no alterations are made to those wetland areas. (Amended by Ordinance 91-19, 94-30, 99-16)

POLICY 9.1.4: Protect agricultural activities on lands designated as Agricultural on the agricultural overlay from the impacts of new ~~mineral~~ natural resource extraction operations, recreational uses, and residential developments. (Amended by Ordinance No. 94-30)

PART III - LOCAL PLANNING AGENCY REVIEW AND RECOMMENDATION

DATE OF PUBLIC HEARING: February 26, 2001

A. LOCAL PLANNING AGENCY REVIEW

Staff presented this amendment before the LPA on February 26, 2001. After some discussion the LPA voted to continue the amendment. One member of the LPA asked for examples of materials that would fall under the definition. Staff noted that sand, gravel, limestone, oil, and gas are some of the most sought out resources in the county. Another member noted there are other materials sought after and suggested staff add language to the glossary term providing examples but not limiting the term to only these materials. Another member of the LPA noted that the glossary term should not be defined with the same words used within the term (extraction) and suggested this be changed. Another member of the LPA questioned if water had been given proper consideration with the proposed changes, due to the fact that water is also a natural resource. A motion was called and carried to continue the amendment until water can be reviewed and given adequate consideration under the context of the proposed amendment.

B. REVISED STAFF ANALYSIS & RECOMMENDED LANGUAGE

Staff has evaluated the concerns of the LPA and offer the revised language provided below. In order to address the word *extraction* within the proposed glossary term staff has replaced it with the word *removing*. According to Black's Law Dictionary the word *removal* is defined as follows:

Removal - In a broad sense, the transfer of a person, thing, or case from one place to another.

In this case the word would be relating to the transfer of a thing, a natural resource, from one place to another. Staff finds that the word *removing* would be a clear and concise word to be included in the glossary term, replacing the word *extraction*.

Staff has also reviewed water under the context of the amendment. There are sufficient safeguards contained within the Lee Plan, the County's plan amendment application, and the Land Development Code in addition to South Florida Water Management District rules protecting and regulating water supply. In addition, after discussions with Lee County Natural Resource staff, it is commonly perceived that the removal of water is considered in conjunction with the term *withdrawal*, rather than the term *extraction*.

Lee Plan

The Lee Plan provides language addressing critical areas for future water supply, the protection of such critical areas, the staff appointed for reviewing proposed development near public utility wellfields, coordination with and criteria set forth by the SFWMD, identifying water pollutant sources, identifying water needs, inspections, the wellfield protection ordinance, and avoidance of premature urbanization. Following are the Goals, Objectives, and Policies from the Future Land Use, Community Facilities and Services, Conservation and Coastal Management, and Housing elements of the Lee Plan which provide the language noted above:

***POLICY 2.4.2:** All proposed changes to the Future Land Use Map in critical areas for future potable water supply (Bonita Springs as described in Policy 13.2.2; Lehigh Acres as described in Policy 34.1.9; and all land in the Density Reduction/ Groundwater Resource land use category) will be subject to a special review by the staff of Lee County. This review will analyze the proposed land uses to determine the short-term and long-term availability of irrigation and domestic water sources, and will assess whether the proposed land uses would cause any significant*

impact on present or future water resources. If the Board of County Commissioners wishes to approve any such changes to the Future Land Use Map, it must make a formal finding that no significant impacts on present or future water resources will result from the change. (Amended by Ordinance No. 92-47) (Amended by Ordinance No. 94-30, 00-22)

POLICY 2.4.3: Future Land Use Map Amendments to the existing DR/GR areas south of SR 82 east of I-75, excluding areas designated by the Port Authority as needed for airport expansion, which increase the current allowable density or intensity of land use will be discouraged by the county. It is Lee County's policy not to approve further urban designations there for the same reasons that supported its 1990 decision to establish this category. In addition to satisfying the requirements in 163 Part II Florida Statutes, Rule 9J-5 of the Florida Administrative Code, the Strategic Regional Policy Plan, the State Comprehensive Plan, and all of the criteria in the Lee Plan, applicants seeking such an amendment must:

1. analyze the proposed allowable land uses to determine the availability of irrigation and domestic water sources; and,
2. identify potential irrigation and domestic water sources, consistent with the Regional Water Supply Plan. Since regional water suppliers cannot obtain permits consistent with the planning time frame of the Lee Plan, water sources do not have to be currently permitted and available, but they must be reasonably capable of being permitted; and,
3. present data and analysis that the proposed land uses will not cause any significant harm to present and future public water resources; and,
4. supply data and analysis specifically addressing the urban sprawl criteria listed in Rule 9J-5.006(5) (g), (h), (i) and (j), FAC.

During the transmittal and adoption process, the Board of County Commissioners must review the application for all these analytical requirements and make a finding that the amendment complies with all of them. (Added by Ordinance No. 97-05)

POLICY 13.2.2: IRRIGATION WELLS. Bonita Springs (as defined in this plan) is hereby declared a critical area for future potable water supply, based on evidence that withdrawals from the main potable aquifer, the lower Tamiami aquifer, are approaching or exceeding the maximum safe yield. In response to this designation, the county will maintain current regulations to provide that new irrigation well permits in Bonita Springs may not utilize the main potable water source. (Also see Policy 34.1.9 for new permit requirements for wells in Lehigh Acres, and Policy 2.4.2 for special requirements for amendments to the Future Land Use Map.) (Amended by Ordinance No. 94-30, 00-22)

POLICY 16.4.8: If a proposed Private Recreation Facilities falls within an area identified as anticipated drawdown zone for existing or future public well development, the project must utilize an alternative water supply such as reuse or withdrawal from a different non-competing aquifer or show that adequate supply is available in excess of that being used for planned public water supply development. (Added by Ordinance No. 99-16)

POLICY 35.1.2: The Lee County Regional Water Supply Authority will plan and coordinate with all member governments in the development of comprehensive plans as they relate to wellfield protection, aquifer recharge, water supply, and related capital facilities. (Added by Ordinance No. 00-22)

POLICY 35.1.3: The Lee County Regional Water Supply Authority will perform groundwater modeling and analysis for new development, as requested by the member governments, to assess the potential impact on the water resources of member governments. The analysis will focus on the following issues:

- Adequacy of water supply, including groundwater level draw-down
- Avoidance of adverse impacts on natural systems from water supply withdrawals.

(Added by Ordinance No. 00-22)

e. Groundwater Recharge

GOAL 43: GROUNDWATER. *To protect the county's groundwater supplies from those activities having the potential for depleting or degrading those supplies.*

OBJECTIVE 43.1: WELLFIELD PROTECTION. *The county will maintain a wellfield protection ordinance to provide regulations protecting the quality of water flowing into potable water wellfields. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 43.1.1: *The wellfield protection ordinance will be amended whenever better technical data is developed and whenever additional potable wellfields are proposed. (Amended by Ordinance No. 00-22)*

POLICY 43.1.2: *The staff hydrogeologist will review and comment on all development applications near public utility potable water wellfields, with particular attention to proposed land uses within a 10-year travel time from the wellheads. (Amended by Ordinance No. 00-22)*

OBJECTIVE 43.2: POTABLE GROUNDWATER. *Base all future development and use of groundwater resources on determinations of the safe yield of the aquifer system(s) in order not to impair the native groundwater quality or create other environmental damage. Criteria for safe-yield determinations will be determined by the SFWMD, the agency charged with permitting these activities. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 43.2.1: *For maximum protection of groundwater resources, identify future wellfields and/or relocation site(s) for existing wellfields well in advance of need. Coordinate with SFWMD, other water suppliers, and DEP to avoid duplication and to assist in data collection and interchange. (Amended by Ordinance No. 94-30)*

POLICY 43.2.2: *Institute a program to identify sources of groundwater pollutants in Lee County and to map these (point and non-point) on a county-wide basis.*

POLICY 43.2.3: *Identify water needs consistent with projections of human population and the needs of natural systems in order to determine the future demands for groundwater. (Amended by Ordinance No. 94-30)*

POLICY 43.2.4: *Expand current programs to identify and map the contamination potential of groundwater resources for those areas of Lee County not currently under public ownership.*

POLICY 43.2.5: *Lee County, in cooperation with other agencies and the municipalities, will budget to maintain its current program of plugging non-valved, abandoned, or improperly-cased artesian wells so that at least seventy-five of these wells are plugged each year until such wells are eliminated. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 85.1.7: *Valid permits and inspection shall be required prior and subsequent to drilling operations for wells, elevator shafts, foundation holes, and test borings.*

POLICY 85.1.8: *The county shall continue its program of plugging improperly constructed wells which are detrimental to groundwater resources. (Amended by Ordinance No. 94-30)*

POLICY 100.9.7: *The county shall coordinate residential development within urban areas to coincide with existing or planned and programmed services and facilities so as to avoid premature or non-contiguous urbanization and the use of septic tanks and private wells for potable water within developed urban areas.*

Plan Amendment Application

Lee County's application for a comprehensive plan amendment requests various forms of support documentation under Part IV of the application. Section F of Part IV provides for additional requirements for specific amendments. Under this section #3 requires requests involving lands in critical areas be evaluated based on Policy 2.4.2. Part IV.F.3. is reproduced below:

3. Requests involving lands in critical areas for future water supply must be evaluated based on policy 2.4.2.

Wellfield Protection Ordinance

The wellfield protection ordinance (Ordinance No. 95-01) was adopted by the Lee County Board of County Commissioners in 1995 and is located under Article III, Section 14-201 through 14-258 of the Land Development Code. The intent of the article, under Section 14-202(b), is reproduced below:

b) The intent of this article is further to safeguard the public health, safety and welfare of the residents of the county by providing criteria for the regulation of activities which may allow the entrance of brackish water into identified protection zones surrounding existing wellfields, and prohibiting or regulating hazardous or toxic substances within identified protection zones surrounding such wellfields, thereby protecting existing public potable water supply wells from contamination. The provisions of this article apply only to the unincorporated areas of the county.

The article establishes and defines four types of wellfield protection zones and adopts protection zone maps. Under Section 14-214, titled *prohibited and regulated activities within protection zones*, earth mining within a 500-foot radius of an existing wellhead is prohibited. Also under this section of the article all protection zones, 1 through 4, are regulated that any stormwater or surface water discharge within the zones will conform to existing South Florida Water Management District and State Department of Environmental Protection rules.

Staff has reviewed and evaluated the natural resource water under the context of the proposed amendment and has determined that there is significant documentation regarding the protection and regulation of this natural resource. All of the County's regulating documents discussed above in addition to the South Florida Water Management Districts regulations, provide standards and prohibitions on the withdrawal of groundwater and the impacts of development and activities on the County's water resources. Staff has concluded that although water is a natural resource the proposed glossary term should exclude this natural resource due to the fact that it is adequately addressed through other regulations and the fact that Goal 10 and its Objectives and Policies primarily concentrate on the extraction of materials, rather than the withdrawal of groundwater.

The revised language to the Glossary term is as follows. No other changes have been made to the initial proposal also shown below. New changes to the proposed term are shown in strike through and double underlining.

Glossary Term:

NATURAL RESOURCE EXTRACTION - The act of ~~extracting removing~~, through various techniques, renewable and non-renewable resources, ~~excluding water~~, in their natural state on or below the surface of the earth. Such resources include but are not limited to sand, gravel, limestone, fill dirt, oil, and natural gas.

GOAL 10: ~~MINERAL~~ NATURAL RESOURCE EXTRACTION. To protect areas containing identified ~~mineral~~ natural resources from incompatible urban development, while insuring that natural resource extraction operations minimize or eliminate adverse effects on surrounding land use and natural resources.

OBJECTIVE 10.1: Designate through the rezoning process sufficient lands suitable for providing fill material, and limerock, and other natural resource extraction materials to meet the county's needs and to export to other communities, while providing adequate protection for the county's natural resources. (Amended by Ordinance No. 94-30)

POLICY 10.1.1: ~~Mineral~~ Natural resource extraction operations intending to withdraw groundwater for any purpose must provide a monitoring system to measure groundwater impacts.

POLICY 10.1.2: Applications for ~~mineral~~ natural resource extraction permits for new or expanding areas must include an environmental assessment. The assessment will include (but not be limited to) consideration of air emissions, impact on environmental and natural resources, effect on nearby land uses, degradation of water quality, depletion of water quantity, drainage, fire and safety, noise, odor, visual impacts, transportation including access roads, sewage disposal, and solid waste disposal. (Amended by Ordinance No. 00-22)

POLICY 10.1.3: Applications for ~~mineral~~ natural resource extraction permits for new or expanding sites must include a reclamation plan which provides assurance of implementation. Reclamation plans in or near important groundwater resource areas must be designed to minimize the possibility of contamination of the groundwater during mining and after completion of the reclamation. (Amended by Ordinance No. 00-22)

POLICY 10.1.4: ~~Mineral~~ Natural resource extraction activities (and industrial uses which are ancillary to ~~mineral~~ natural resource extraction) may be permitted in areas indicated on the Future Land Use Map as Rural, Open Lands, and Density Reduction/Groundwater Resources, provided they have adequate fire protection, transportation facilities, wastewater treatment and water supply, and provided further that they have no significant adverse effects such as dust and noise on surrounding land uses and natural resources. In order to reduce transport costs and minimize wear on the county's roadways, the extraction and transport of fill material may also be permitted as an interim use in the Future Urban Areas provided that the above requirements are met; however, special restrictions may also be applied to protect other land uses. These determinations will be made during the rezoning process. (Amended by Ordinance No. 94-30, 00-22)

POLICY 10.1.5: Lee County will support efforts by government, community leaders, and the ~~rock mining~~ extractive industry owners and businesses to seek incentives that will help to facilitate the connection of ~~rock mining~~ natural resource extraction borrow lake excavations into a system of interconnected lakes and flowways that will enhance wildlife habitat values, provide for human recreation, educational and other appropriate uses, and/or strengthen community environmental benefits. (Added by Ordinance No. 99-15)

OBJECTIVE 10.2: Determine and maintain a balance between the County's petroleum resources and the health, safety and welfare of the residents of its Future Urban Areas. (Added by Ordinance No. 98-09)

POLICY 10.2.1: By 2000, the county will conduct a study to determine the appropriateness of oil exploration, drilling, or production. The study will address the issues of the compatibility of oil-related activities with the environment and urban uses. This study will include recommendations regarding the appropriateness of such activities within Lee County as well as guidelines under which such activities should be regulated under the Lee County Land Development Code. (Added by Ordinance No. 98-09, Amended by Ordinance No. 00-22)

Additional Policies:

POLICY 1.1.7: The Industrial Development areas play an important role in strengthening the county's economic base and will become increasingly important as the county grows in size and urban complexity. To a great extent these are the areas to which Lee County must look for expanded job opportunities, investments and production opportunities, and a balanced and sufficient tax base. These areas have special locational requirements that are more stringent than those for residential areas, including transportation needs (e.g., air, rail, highway); industrial levels of water, sewer, fire protection, and other urban services; and locations that are convenient for employees to reach. Whereas the other Future Urban Areas will include a broad combination of residential, commercial, public, and limited industrial land uses, the Industrial Development area is to be reserved mainly for industrial activities per se, as well as for selective land use mixtures such as the combined uses of industrial, manufacturing, research, properly buffered recreational uses (except where precluded by airport hazard zone regulations), and office complexes (if specifically related to adjoining industrial uses) that constitute a growing part of Florida's economic development sector. New ~~mineral~~ natural resource extraction (mining) activities and fill dirt operations must be approved through the Industrial Planned Development rezoning process. Retail or wholesale of products manufactured or processed upon the premises may be allowed at a ratio of 1 square foot of commercial uses to 10 square feet of industrial use in association with a Planned Development. Ancillary minor retail commercial uses intended to support the surrounding industrial land uses may not exceed 30,000 square feet per development; and, at buildout, may not exceed more than ten percent (10%) of the total acreage of the lands designated as Industrial Development areas in each community outlined in Map 16. Residential uses, other than bona fide caretaker residences, are not permitted in this category except to the extent provided in Chapter XIII of the Plan. (Amended by Ordinance No. 94-30, 98-09, 99-15)

POLICY 1.4.5: The Density Reduction/Groundwater Resource (DR/GR) areas include upland areas that provide substantial recharge to aquifers most suitable for future wellfield development. These areas also are the most favorable locations for physical withdrawal of water from those aquifers. Only minimal public facilities exist or are programmed. Land uses in these areas must be compatible with maintaining surface and groundwater levels at their historic levels. Permitted land uses include agriculture, ~~mineral or limestone~~ natural resource extraction and related facilities, conservation uses, publicly-owned gun range facilities, private recreation facilities, and residential uses at a maximum density of one dwelling unit per ten acres (1 du/10 acres). Individual residential parcels may contain up to two acres of Wetlands without losing the right to have a dwelling unit, provided that no alterations are made to those wetland areas. (Amended by Ordinance 91-19, 94-30, 99-16)

POLICY 9.1.4: Protect agricultural activities on lands designated as Agricultural on the agricultural overlay from the impacts of new ~~mineral~~ natural resource extraction operations, recreational uses, and residential developments. (Amended by Ordinance No. 94-30)

**LOCAL PLANNING AGENCY
REVIEW AND RECOMMENDATION**

DATE OF PUBLIC HEARING: March 26, 2001

C. LOCAL PLANNING AGENCY REVIEW

Staff presented this amendment before the LPA on March 26, 2001. Staff clarified the changes made to the proposed language since it had been presented before the LPA in February. The LPA provided no discussion concerning the proposed amendment.

D. LOCAL PLANNING AGENCY RECOMMENDATION AND FINDINGS OF FACT SUMMARY

1. **RECOMMENDATION:** The LPA recommends that the Board of County Commissioners transmit this amendment.
2. **BASIS AND RECOMMENDED FINDINGS OF FACT:** The LPA accepted the findings of fact as advanced by the staff.

E. VOTE:

NOEL ANDRESS	_____ AYE
SUSAN BROOKMAN	_____ AYE
BARRY ERNST	_____ AYE
RONALD INGE	_____ AYE
GORDON REIGELMAN	_____ AYE
VIRGINIA SPLITT	_____ ABSENT
GREG STUART	_____ AYE

**PART IV - BOARD OF COUNTY COMMISSIONERS
HEARING FOR TRANSMITTAL OF PROPOSED AMENDMENT**

DATE OF TRANSMITTAL HEARING: August 29, 2001

A. BOARD REVIEW: The Board of County Commissioners provided no discussion concerning the proposed plan amendment. This item was approved on the consent agenda.

B. BOARD ACTION AND FINDINGS OF FACT SUMMARY:

1. **BOARD ACTION:** The Board of County Commissioners voted to transmit the proposed plan amendment.
2. **BASIS AND RECOMMENDED FINDINGS OF FACT:** The Board accepted the findings of fact advanced by staff and the LPA.

C. VOTE:

JOHN ALBION

AYE

ANDREW COY

AYE

BOB JANES

AYE

RAY JUDAH

AYE

DOUG ST. CERNY

AYE

**PART V - DEPARTMENT OF COMMUNITY AFFAIRS OBJECTIONS,
RECOMMENDATIONS, AND COMMENTS (ORC) REPORT**

DATE OF ORC REPORT: November 21, 2001

A. DCA OBJECTIONS, RECOMMENDATIONS AND COMMENTS

The DCA had no objections, recommendations, or comments concerning this amendment.

B. STAFF RECOMMENDATION

Adopt the amendment as transmitted.

**PART VI - BOARD OF COUNTY COMMISSIONERS
HEARING FOR ADOPTION OF PROPOSED AMENDMENT**

DATE OF ADOPTION HEARING: January 10, 2002

A. BOARD REVIEW:

B. BOARD ACTION AND FINDINGS OF FACT SUMMARY:

1. BOARD ACTION:

2. BASIS AND RECOMMENDED FINDINGS OF FACT:

C. VOTE:

JOHN ALBION

ANDREW COY

BOB JANES

RAY JUDAH

DOUG ST. CERNY

**CPA2000-29
BoCC SPONSORED
AMENDMENT
TO THE**

LEE COUNTY COMPREHENSIVE PLAN

THE LEE PLAN

DCA Transmittal Document

*Lee County Planning Division
1500 Monroe Street
P.O. Box 398
Fort Myers, FL 33902-0398
(941) 479-8585*

August 29, 2001

**LEE COUNTY
DIVISION OF PLANNING
STAFF REPORT FOR
COMPREHENSIVE PLAN AMENDMENT
CPA2000-29**

☒

Text Amendment

☐

Map Amendment

✓	This Document Contains the Following Reviews:
✓	Staff Review
✓	Local Planning Agency Review and Recommendation
✓	Board of County Commissioners Hearing for Transmittal
	Staff Response to the DCA Objections, Recommendations, and Comments (ORC) Report
	Board of County Commissioners Hearing for Adoption

STAFF REPORT PREPARATION DATE: February 19, 2001

PART I - BACKGROUND AND STAFF RECOMMENDATION

A. SUMMARY OF APPLICATION

1. APPLICANT:

LEE COUNTY BOARD OF COUNTY COMMISSIONERS
REPRESENTED BY LEE COUNTY DIVISION OF PLANNING

2. REQUEST:

Evaluate adding a definition for the term "Natural Resource Extraction" to the Lee Plan Glossary. In addition, amend the Future Land Use Element by adding the term "Natural Resource Extraction" to Goal 10 and its Objectives and Policies, where applicable, clarifying that natural resources other than minerals are subject to Goal 10 requirements.

B. STAFF RECOMMENDATION AND FINDINGS OF FACT SUMMARY:

1. RECOMMENDATION: Planning staff recommends that the Board of County Commissioners transmit the proposed amendment as provided under Part III.B., the Revised Staff Analysis & Recommended Language portion of this report.

2. BASIS AND RECOMMENDED FINDINGS OF FACT:

- A broader term for mineral extraction is needed to clarify that natural resources other than minerals are subject to Goal 10 requirements.
- Principal resources sought in Lee County are sand, gravel, limestone, oil and gas which include both organic and inorganic materials.
- It should be ensured that all mined materials, organic and inorganic, are included under the language of Goal 10.
- The improved term, "Natural Resource Extraction," should be placed in the Lee Plan Glossary to support the new term.

C. BACKGROUND INFORMATION

This amendment was initiated by the Board of County Commissioners on September 19, 2000. The amendment stems from a suggested improvement to the Lee Plan by an LPA member. This issue was brought up during a public hearing in which the upcoming amendment cycle was being discussed and suggestions taken. The proposal was for staff to evaluate Goal 10, Mineral Extraction, and its references to limerock. This member of the LPA noted that technically limerock is not a mineral, but is an organic material and suggested adding improved language such as a definition for natural resource extraction.

PART II - STAFF ANALYSIS

A. STAFF DISCUSSION

Goal 10 and its Objective and Policies address the extractive industry in Lee County and provides for the protection of natural resources, such as mineral resources, while limiting the potential adverse effects associated with the extraction of such resources. Goal 10, Objective 10.1, and the policies that follow are reproduced below:

GOAL 10: MINERAL EXTRACTION. *To protect areas containing identified mineral resources from incompatible urban development, while insuring that extraction operations minimize or eliminate adverse effects on surrounding land use and natural resources.*

OBJECTIVE 10.1: *Designate through the rezoning process sufficient lands suitable for providing fill material and limerock to meet the county's needs and to export to other communities, while providing adequate protection for the county's natural resources. (Amended by Ordinance No. 94-30)*

POLICY 10.1.1: *Mineral extraction operations intending to withdraw groundwater for any purpose must provide a monitoring system to measure groundwater impacts.*

POLICY 10.1.2: *Applications for mineral extraction permits for new or expanding areas must include an environmental assessment. The assessment will include (but not be limited to) consideration of air emissions, impact on environmental and natural resources, effect on nearby land uses, degradation of water quality, depletion of water quantity, drainage, fire and safety, noise, odor, visual impacts, transportation including access roads, sewage disposal, and solid waste disposal. (Amended by Ordinance No. 00-22)*

POLICY 10.1.3: *Applications for mineral extraction permits for new or expanding sites must include a reclamation plan which provides assurance of implementation. Reclamation plans in or near important groundwater resource areas must be designed to minimize the possibility of contamination of the groundwater during mining and after completion of the reclamation. (Amended by Ordinance No. 00-22)*

POLICY 10.1.4: *Mineral extraction activities (and industrial uses which are ancillary to mineral extraction) may be permitted in areas indicated on the Future Land Use Map as Rural, Open Lands, and Density Reduction/Groundwater Resources, provided they have adequate fire protection, transportation facilities, wastewater treatment and water supply, and provided further that they have no significant adverse effects such as dust and noise on surrounding land uses and natural resources. In order to reduce transport costs and minimize wear on the county's roadways, the extraction and transport of fill material may also be permitted as an interim use in the Future Urban Areas provided that the above requirements are met; however, special restrictions may also be applied to protect other land uses. These determinations will be made during the rezoning process. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 10.1.5: *Lee County will support efforts by government, community leaders, and the rock mining industry owners and businesses to seek incentives that will help to facilitate the connection of rock mining borrow lake excavations into a system of interconnected lakes and flowways that will enhance wildlife habitat values, provide for human recreation, educational and other appropriate uses, and/or strengthen community environmental benefits. (Added by Ordinance No. 99-15)*

The Goal provides specific language for the protection of mineral resources, the protection of surrounding land uses, reclamation, the prevention of the degradation of environmental resources and existing infrastructure, and provides language on the enhancement of the environment as an end result of extraction activities. The principal resources sought in Lee County, pertaining to the extraction industry, are sand, gravel, limestone, oil, and gas. These resources include both organic and inorganic materials according to the following two definitions of "mineral" and "limestone" taken from the Dictionary of Natural Resource Management (1996):

MINERAL *A non-technical word more specifically defined by legislation, usually involving one or more of the following: (1) a scientifically recognized inorganic material; (2) a material classified commercially as a mineral; (3) a material derived from the earth that possesses economic value and utility aside from the agricultural purposes of the land surface itself.*

Minerals include sand, gravel (common minerals), precious or semi-precious stones, coal, petroleum resources, and natural gas, even though the latter three are not inorganic. Some definitions limit the term to inorganic materials having a distinct chemical composition, characteristic crystalline structure, colour, and hardness.

LIMESTONE *A sedimentary rock consisting mainly (greater than 50 per cent) of calcium carbonate, typically as calcite. Limestone is formed by a combination of organic and inorganic processes and includes chemical and clastic (soluble and insoluble) constituents. Many forms of limestone contain fossils.*

Staff has evaluated Goal 10 and its Objectives and Policies, where applicable, and concur that a broader term for mineral extraction is needed to clarify that natural resources other than minerals are subject to Goal 10 requirements. Staff has evaluated the term *natural resource extraction* and also concurs that this would be the best term to ensure the inclusion of all materials, organic and inorganic, sought by the extractive industry. Throughout the language under Goal 10, mineral extraction, limerock, and rock mining are referenced.

Mining and fill dirt operations are required elements in a well balanced economy. Such operations provide fill allowing development to occur and provide raw materials for many other products. The proposed amendment will correct and bring all of the resources intended to be regulated under the Goal under unified terminology. Staff is proposing to add a definition of *natural resource extraction* to the Lee Plan Glossary.

In addition to the broader term and Glossary definition, staff is recommending that the term rock mining industry in Policy 10.1.5 be replaced with the term extractive industry. This will allow the language of the policy to include all types of mining. Staff is also recommending that Policy 1.1.7, Policy 1.4.5, and Policy 9.1.4 of the Future Land Use Element, which include references to mineral extraction, be amended to include the proposed term *natural resource extraction*.

B. CONCLUSIONS

Goal 10 and its Objectives and Policies give specific language in regards to extraction requirements yet refers only to mineral extraction. In light of the fact that limerock is a major resource found within the County but would not technically fall under the term "mineral" due to its organic properties, staff is proposing that the term *natural resource extraction* be adopted to replace the references to mineral extraction. Staff also proposes a definition in the Lee Plan Glossary to support the new term and also proposes the replacement of references to mineral extraction in Policy 1.1.7, Policy 1.4.5, and Policy 9.1.4 of the Future Land Use Element.

C. STAFF RECOMMENDATION

Planning staff recommends that the Board of County Commissioners transmit the proposed plan amendment. The proposed language is as follows.

GOAL 10: ~~MINERAL~~ NATURAL RESOURCE EXTRACTION. To protect areas containing identified ~~mineral~~ natural resources from incompatible urban development, while insuring that natural resource extraction operations minimize or eliminate adverse effects on surrounding land use and natural resources.

OBJECTIVE 10.1: Designate through the rezoning process sufficient lands suitable for providing fill material, ~~and limerock, and other~~ natural resource extraction materials to meet the county's needs and to export to other communities, while providing adequate protection for the county's natural resources. (Amended by Ordinance No. 94-30)

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OBJECTIVE 10.2: Determine and maintain a balance between the County's petroleum resources and the health, safety and welfare of the residents of its Future Urban Areas. (Added by Ordinance No. 98-09)

POLICY 10.2.1: By 2000, the county will conduct a study to determine the appropriateness of oil exploration, drilling, or production. The study will address the issues of the compatibility of oil-related activities with the environment and urban uses. This study will include recommendations regarding the appropriateness of such activities within Lee County as well as guidelines under which such activities should be regulated under the Lee County Land Development Code. (Added by Ordinance No. 98-09, Amended by Ordinance No. 00-22)

Glossary Term:

NATURAL RESOURCE EXTRACTION - The act of extracting, through various techniques, renewable and non-renewable resources in their natural state on or below the surface of the earth.

Additional Policies:

POLICY 1.1.7: The Industrial Development areas play an important role in strengthening the county's economic base and will become increasingly important as the county grows in size and urban complexity. To a great extent these are the areas to which Lee County must look for expanded job opportunities, investments and production opportunities, and a balanced and sufficient tax base. These areas have special locational requirements that are more stringent than those for residential areas, including transportation needs (e.g., air, rail, highway); industrial levels of water, sewer, fire protection, and other urban services; and locations that are convenient for employees to reach. Whereas the other Future Urban Areas will include a broad combination of residential, commercial, public, and limited industrial land uses, the Industrial Development area is to be reserved mainly for industrial activities per se, as well as for selective land use mixtures such as the combined uses of industrial, manufacturing, research, properly buffered recreational uses (except where precluded by airport hazard zone regulations), and office complexes (if specifically related to adjoining industrial uses) that constitute a growing part of Florida's economic development sector. New ~~mineral natural resource~~ extraction (mining) activities and fill dirt operations must be approved through the Industrial Planned Development rezoning process. Retail or wholesale of products manufactured or processed upon the premises may be allowed at a ratio of 1 square foot of commercial uses to 10 square feet of industrial use in association with a Planned Development. Ancillary minor retail commercial uses intended to support the surrounding industrial land uses may not exceed 30,000 square feet per development; and, at buildout, may not exceed more than ten percent (10%) of the total acreage of the lands designated as Industrial Development areas in each community outlined in Map

16. Residential uses, other than bona fide caretaker residences, are not permitted in this category except to the extent provided in Chapter XIII of the Plan. (Amended by Ordinance No. 94-30, 98-09, 99-15)

POLICY 1.4.5: The Density Reduction/Groundwater Resource (DR/GR) areas include upland areas that provide substantial recharge to aquifers most suitable for future wellfield development. These areas also are the most favorable locations for physical withdrawal of water from those aquifers. Only minimal public facilities exist or are programmed. Land uses in these areas must be compatible with maintaining surface and groundwater levels at their historic levels. Permitted land uses include agriculture, ~~mineral or limestone~~ natural resource extraction and related facilities, conservation uses, publicly-owned gun range facilities, private recreation facilities, and residential uses at a maximum density of one dwelling unit per ten acres (1 du/10 acres). Individual residential parcels may contain up to two acres of Wetlands without losing the right to have a dwelling unit, provided that no alterations are made to those wetland areas. (Amended by Ordinance 91-19, 94-30, 99-16)

POLICY 9.1.4: Protect agricultural activities on lands designated as Agricultural on the agricultural overlay from the impacts of new ~~mineral~~ natural resource extraction operations, recreational uses, and residential developments. (Amended by Ordinance No. 94-30)

PART III - LOCAL PLANNING AGENCY REVIEW AND RECOMMENDATION

DATE OF PUBLIC HEARING: February 26, 2001

A. LOCAL PLANNING AGENCY REVIEW

Staff presented this amendment before the LPA on February 26, 2001. After some discussion the LPA voted to continue the amendment. One member of the LPA asked for examples of materials that would fall under the definition. Staff noted that sand, gravel, limestone, oil, and gas are some of the most sought out resources in the county. Another member noted there are other materials sought after and suggested staff add language to the glossary term providing examples but not limiting the term to only these materials. Another member of the LPA noted that the glossary term should not be defined with the same words used within the term (extraction) and suggested this be changed. Another member of the LPA questioned if water had been given proper consideration with the proposed changes, due to the fact that water is also a natural resource. A motion was called and carried to continue the amendment until water can be reviewed and given adequate consideration under the context of the proposed amendment.

B. REVISED STAFF ANALYSIS & RECOMMENDED LANGUAGE

Staff has evaluated the concerns of the LPA and offer the revised language provided below. In order to address the word *extraction* within the proposed glossary term staff has replaced it with the word *removing*. According to Black's Law Dictionary the word *removal* is defined as follows:

Removal - In a broad sense, the transfer of a person, thing, or case from one place to another.

In this case the word would be relating to the transfer of a thing, a natural resource, from one place to another. Staff finds that the word *removing* would be a clear and concise word to be included in the glossary term, replacing the word *extraction*.

Staff has also reviewed water under the context of the amendment. There are sufficient safeguards contained within the Lee Plan, the County's plan amendment application, and the Land Development Code in addition to South Florida Water Management District rules protecting and regulating water supply. In addition, after discussions with Lee County Natural Resource staff, it is commonly perceived that the removal of water is considered in conjunction with the term withdrawal, rather than the term extraction.

Lee Plan

The Lee Plan provides language addressing critical areas for future water supply, the protection of such critical areas, the staff appointed for reviewing proposed development near public utility wellfields, coordination with and criteria set forth by the SFWMD, identifying water pollutant sources, identifying water needs, inspections, the wellfield protection ordinance, and avoidance of premature urbanization. Following are the Goals, Objectives, and Policies from the Future Land Use, Community Facilities and Services, Conservation and Coastal Management, and Housing elements of the Lee Plan which provide the language noted above:

***POLICY 2.4.2:** All proposed changes to the Future Land Use Map in critical areas for future potable water supply (Bonita Springs as described in Policy 13.2.2; Lehigh Acres as described in Policy 34.1.9; and all land in the Density Reduction/ Groundwater Resource land use category) will be subject to a special review by the staff of Lee County. This review will analyze the proposed land uses to determine the short-term and long-term availability of irrigation and domestic water sources, and will assess whether the proposed land uses would cause any significant*

impact on present or future water resources. If the Board of County Commissioners wishes to approve any such changes to the Future Land Use Map, it must make a formal finding that no significant impacts on present or future water resources will result from the change. (Amended by Ordinance No. 92-47) (Amended by Ordinance No. 94-30, 00-22)

POLICY 2.4.3: Future Land Use Map Amendments to the existing DR/GR areas south of SR 82 east of I-75, excluding areas designated by the Port Authority as needed for airport expansion, which increase the current allowable density or intensity of land use will be discouraged by the county. It is Lee County's policy not to approve further urban designations there for the same reasons that supported its 1990 decision to establish this category. In addition to satisfying the requirements in 163 Part II Florida Statutes, Rule 9J-5 of the Florida Administrative Code, the Strategic Regional Policy Plan, the State Comprehensive Plan, and all of the criteria in the Lee Plan, applicants seeking such an amendment must:

1. analyze the proposed allowable land uses to determine the availability of irrigation and domestic water sources; and,
2. identify potential irrigation and domestic water sources, consistent with the Regional Water Supply Plan. Since regional water suppliers cannot obtain permits consistent with the planning time frame of the Lee Plan, water sources do not have to be currently permitted and available, but they must be reasonably capable of being permitted; and,
3. present data and analysis that the proposed land uses will not cause any significant harm to present and future public water resources; and,
4. supply data and analysis specifically addressing the urban sprawl criteria listed in Rule 9J-5.006(5) (g), (h), (i) and (j), FAC.

During the transmittal and adoption process, the Board of County Commissioners must review the application for all these analytical requirements and make a finding that the amendment complies with all of them. (Added by Ordinance No. 97-05)

POLICY 13.2.2: IRRIGATION WELLS. Bonita Springs (as defined in this plan) is hereby declared a critical area for future potable water supply, based on evidence that withdrawals from the main potable aquifer, the lower Tamiami aquifer, are approaching or exceeding the maximum safe yield. In response to this designation, the county will maintain current regulations to provide that new irrigation well permits in Bonita Springs may not utilize the main potable water source. (Also see Policy 34.1.9 for new permit requirements for wells in Lehigh Acres, and Policy 2.4.2 for special requirements for amendments to the Future Land Use Map.) (Amended by Ordinance No. 94-30, 00-22)

POLICY 16.4.8: If a proposed Private Recreation Facilities falls within an area identified as anticipated drawdown zone for existing or future public well development, the project must utilize an alternative water supply such as reuse or withdrawal from a different non-competing aquifer or show that adequate supply is available in excess of that being used for planned public water supply development. (Added by Ordinance No. 99-16)

POLICY 35.1.2: The Lee County Regional Water Supply Authority will plan and coordinate with all member governments in the development of comprehensive plans as they relate to wellfield protection, aquifer recharge, water supply, and related capital facilities. (Added by Ordinance No. 00-22)

POLICY 35.1.3: The Lee County Regional Water Supply Authority will perform groundwater modeling and analysis for new development, as requested by the member governments, to assess the potential impact on the water resources of member governments. The analysis will focus on the following issues:

- Adequacy of water supply, including groundwater level draw-down
 - Avoidance of adverse impacts on natural systems from water supply withdrawals.
- (Added by Ordinance No. 00-22)

e. Groundwater Recharge

GOAL 43: GROUNDWATER. *To protect the county's groundwater supplies from those activities having the potential for depleting or degrading those supplies.*

OBJECTIVE 43.1: WELLFIELD PROTECTION. *The county will maintain a wellfield protection ordinance to provide regulations protecting the quality of water flowing into potable water wellfields. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 43.1.1: *The wellfield protection ordinance will be amended whenever better technical data is developed and whenever additional potable wellfields are proposed. (Amended by Ordinance No. 00-22)*

POLICY 43.1.2: *The staff hydrogeologist will review and comment on all development applications near public utility potable water wellfields, with particular attention to proposed land uses within a 10-year travel time from the wellheads. (Amended by Ordinance No. 00-22)*

OBJECTIVE 43.2: POTABLE GROUNDWATER. *Base all future development and use of groundwater resources on determinations of the safe yield of the aquifer system(s) in order not to impair the native groundwater quality or create other environmental damage. Criteria for safe-yield determinations will be determined by the SFWMD, the agency charged with permitting these activities. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 43.2.1: *For maximum protection of groundwater resources, identify future wellfields and/or relocation site(s) for existing wellfields well in advance of need. Coordinate with SFWMD, other water suppliers, and DEP to avoid duplication and to assist in data collection and interchange. (Amended by Ordinance No. 94-30)*

POLICY 43.2.2: *Institute a program to identify sources of groundwater pollutants in Lee County and to map these (point and non-point) on a county-wide basis.*

POLICY 43.2.3: *Identify water needs consistent with projections of human population and the needs of natural systems in order to determine the future demands for groundwater. (Amended by Ordinance No. 94-30)*

POLICY 43.2.4: *Expand current programs to identify and map the contamination potential of groundwater resources for those areas of Lee County not currently under public ownership.*

POLICY 43.2.5: *Lee County, in cooperation with other agencies and the municipalities, will budget to maintain its current program of plugging non-valved, abandoned, or improperly-cased artesian wells so that at least seventy-five of these wells are plugged each year until such wells are eliminated. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 85.1.7: *Valid permits and inspection shall be required prior and subsequent to drilling operations for wells, elevator shafts, foundation holes, and test borings.*

POLICY 85.1.8: *The county shall continue its program of plugging improperly constructed wells which are detrimental to groundwater resources. (Amended by Ordinance No. 94-30)*

POLICY 100.9.7: *The county shall coordinate residential development within urban areas to coincide with existing or planned and programmed services and facilities so as to avoid premature or non-contiguous urbanization and the use of septic tanks and private wells for potable water within developed urban areas.*

Plan Amendment Application

Lee County's application for a comprehensive plan amendment requests various forms of support documentation under Part IV of the application. Section F of Part IV provides for additional requirements for specific amendments. Under this section #3 requires requests involving lands in critical areas be evaluated based on Policy 2.4.2. Part IV.F.3. is reproduced below:

3. Requests involving lands in critical areas for future water supply must be evaluated based on policy 2.4.2.

Wellfield Protection Ordinance

The wellfield protection ordinance (Ordinance No. 95-01) was adopted by the Lee County Board of County Commissioners in 1995 and is located under Article III, Section 14-201 through 14-258 of the Land Development Code. The intent of the article, under Section 14-202(b), is reproduced below:

b) The intent of this article is further to safeguard the public health, safety and welfare of the residents of the county by providing criteria for the regulation of activities which may allow the entrance of brackish water into identified protection zones surrounding existing wellfields, and prohibiting or regulating hazardous or toxic substances within identified protection zones surrounding such wellfields, thereby protecting existing public potable water supply wells from contamination. The provisions of this article apply only to the unincorporated areas of the county.

The article establishes and defines four types of wellfield protection zones and adopts protection zone maps. Under Section 14-214, titled *prohibited and regulated activities within protection zones*, earth mining within a 500-foot radius of an existing wellhead is prohibited. Also under this section of the article all protection zones, 1 through 4, are regulated that any stormwater or surface water discharge within the zones will conform to existing South Florida Water Management District and State Department of Environmental Protection rules.

Staff has reviewed and evaluated the natural resource water under the context of the proposed amendment and has determined that there is significant documentation regarding the protection and regulation of this natural resource. All of the County's regulating documents discussed above in addition to the South Florida Water Management Districts regulations, provide standards and prohibitions on the withdrawal of groundwater and the impacts of development and activities on the County's water resources. Staff has concluded that although water is a natural resource the proposed glossary term should exclude this natural resource due to the fact that it is adequately addressed through other regulations and the fact that Goal 10 and its Objectives and Policies primarily concentrate on the extraction of materials, rather than the withdrawal of groundwater.

The revised language to the Glossary term is as follows. No other changes have been made to the initial proposal also shown below. New changes to the proposed term are shown in strike through and double underlining.

Glossary Term:

NATURAL RESOURCE EXTRACTION - The act of ~~extracting removing~~, through various techniques, renewable and non-renewable resources, excluding water, in their natural state on or below the surface of the earth. Such resources include but are not limited to sand, gravel, limestone, fill dirt, oil, and natural gas.

GOAL 10: ~~MINERAL~~ NATURAL RESOURCE EXTRACTION. To protect areas containing identified ~~mineral~~ natural resources from incompatible urban development, while insuring that natural resource extraction operations minimize or eliminate adverse effects on surrounding land use and natural resources.

OBJECTIVE 10.1: Designate through the rezoning process sufficient lands suitable for providing fill material, ~~and limerock, and other natural resource extraction materials~~ to meet the county's needs and to export to other communities, while providing adequate protection for the county's natural resources. (Amended by Ordinance No. 94-30)

POLICY 10.1.1: ~~Mineral~~ Natural resource extraction operations intending to withdraw groundwater for any purpose must provide a monitoring system to measure groundwater impacts.

POLICY 10.1.2: Applications for ~~mineral~~ natural resource extraction permits for new or expanding areas must include an environmental assessment. The assessment will include (but not be limited to) consideration of air emissions, impact on environmental and natural resources, effect on nearby land uses, degradation of water quality, depletion of water quantity, drainage, fire and safety, noise, odor, visual impacts, transportation including access roads, sewage disposal, and solid waste disposal. (Amended by Ordinance No. 00-22)

POLICY 10.1.3: Applications for ~~mineral~~ natural resource extraction permits for new or expanding sites must include a reclamation plan which provides assurance of implementation. Reclamation plans in or near important groundwater resource areas must be designed to minimize the possibility of contamination of the groundwater during mining and after completion of the reclamation. (Amended by Ordinance No. 00-22)

POLICY 10.1.4: ~~Mineral~~ Natural resource extraction activities (and industrial uses which are ancillary to ~~mineral~~ natural resource extraction) may be permitted in areas indicated on the Future Land Use Map as Rural, Open Lands, and Density Reduction/Groundwater Resources, provided they have adequate fire protection, transportation facilities, wastewater treatment and water supply, and provided further that they have no significant adverse effects such as dust and noise on surrounding land uses and natural resources. In order to reduce transport costs and minimize wear on the county's roadways, the extraction and transport of fill material may also be permitted as an interim use in the Future Urban Areas provided that the above requirements are met; however, special restrictions may also be applied to protect other land uses. These determinations will be made during the rezoning process. (Amended by Ordinance No. 94-30, 00-22)

POLICY 10.1.5: Lee County will support efforts by government, community leaders, and the ~~rock mining~~ extractive industry owners and businesses to seek incentives that will help to facilitate the connection of ~~rock mining~~ natural resource extraction borrow lake excavations into a system of interconnected lakes and flowways that will enhance wildlife habitat values, provide for human recreation, educational and other appropriate uses, and/or strengthen community environmental benefits. (Added by Ordinance No. 99-15)

OBJECTIVE 10.2: Determine and maintain a balance between the County's petroleum resources and the health, safety and welfare of the residents of its Future Urban Areas. (Added by Ordinance No. 98-09)

POLICY 10.2.1: By 2000, the county will conduct a study to determine the appropriateness of oil exploration, drilling, or production. The study will address the issues of the compatibility of oil-related activities with the environment and urban uses. This study will include recommendations regarding the appropriateness of such activities within Lee County as well as guidelines under which such activities should be regulated under the Lee County Land Development Code. (Added by Ordinance No. 98-09, Amended by Ordinance No. 00-22)

Additional Policies:

POLICY 1.1.7: The Industrial Development areas play an important role in strengthening the county's economic base and will become increasingly important as the county grows in size and urban complexity. To a great extent these are the areas to which Lee County must look for expanded job opportunities, investments and production opportunities, and a balanced and sufficient tax base. These areas have special locational requirements that are more stringent than those for residential areas, including transportation needs (e.g., air, rail, highway); industrial levels of water, sewer, fire protection, and other urban services; and locations that are convenient for employees to reach. Whereas the other Future Urban Areas will include a broad combination of residential, commercial, public, and limited industrial land uses, the Industrial Development area is to be reserved mainly for industrial activities per se, as well as for selective land use mixtures such as the combined uses of industrial, manufacturing, research, properly buffered recreational uses (except where precluded by airport hazard zone regulations), and office complexes (if specifically related to adjoining industrial uses) that constitute a growing part of Florida's economic development sector. New ~~mineral~~ natural resource extraction (mining) activities and fill dirt operations must be approved through the Industrial Planned Development rezoning process. Retail or wholesale of products manufactured or processed upon the premises may be allowed at a ratio of 1 square foot of commercial uses to 10 square feet of industrial use in association with a Planned Development. Ancillary minor retail commercial uses intended to support the surrounding industrial land uses may not exceed 30,000 square feet per development; and, at buildout, may not exceed more than ten percent (10%) of the total acreage of the lands designated as Industrial Development areas in each community outlined in Map 16. Residential uses, other than bona fide caretaker residences, are not permitted in this category except to the extent provided in Chapter XIII of the Plan. (Amended by Ordinance No. 94-30, 98-09, 99-15)

POLICY 1.4.5: The Density Reduction/Groundwater Resource (DR/GR) areas include upland areas that provide substantial recharge to aquifers most suitable for future wellfield development. These areas also are the most favorable locations for physical withdrawal of water from those aquifers. Only minimal public facilities exist or are programmed. Land uses in these areas must be compatible with maintaining surface and groundwater levels at their historic levels. Permitted land uses include agriculture, ~~mineral or limestone~~ natural resource extraction and related facilities, conservation uses, publicly-owned gun range facilities, private recreation facilities, and residential uses at a maximum density of one dwelling unit per ten acres (1 du/10 acres). Individual residential parcels may contain up to two acres of Wetlands without losing the right to have a dwelling unit, provided that no alterations are made to those wetland areas. (Amended by Ordinance 91-19, 94-30, 99-16)

POLICY 9.1.4: Protect agricultural activities on lands designated as Agricultural on the agricultural overlay from the impacts of new ~~mineral~~ natural resource extraction operations, recreational uses, and residential developments. (Amended by Ordinance No. 94-30)

**LOCAL PLANNING AGENCY
REVIEW AND RECOMMENDATION**

DATE OF PUBLIC HEARING: March 26, 2001

C. LOCAL PLANNING AGENCY REVIEW

Staff presented this amendment before the LPA on March 26, 2001. Staff clarified the changes made to the proposed language since it had been presented before the LPA in February. The LPA provided no discussion concerning the proposed amendment.

D. LOCAL PLANNING AGENCY RECOMMENDATION AND FINDINGS OF FACT SUMMARY

1. **RECOMMENDATION:** The LPA recommends that the Board of County Commissioners transmit this amendment.
2. **BASIS AND RECOMMENDED FINDINGS OF FACT:** The LPA accepted the findings of fact as advanced by the staff.

E. VOTE:

NOEL ANDRESS	<u>AYE</u>
SUSAN BROOKMAN	<u>AYE</u>
BARRY ERNST	<u>AYE</u>
RONALD INGE	<u>AYE</u>
GORDON REIGELMAN	<u>AYE</u>
VIRGINIA SPLITT	<u>ABSENT</u>
GREG STUART	<u>AYE</u>

**PART IV - BOARD OF COUNTY COMMISSIONERS
HEARING FOR TRANSMITTAL OF PROPOSED AMENDMENT**

DATE OF TRANSMITTAL HEARING: August 29, 2001

A. BOARD REVIEW: The Board of County Commissioners provided no discussion concerning the proposed plan amendment. This item was approved on the consent agenda.

B. BOARD ACTION AND FINDINGS OF FACT SUMMARY:

1. **BOARD ACTION:** The Board of County Commissioners voted to transmit the proposed plan amendment.
2. **BASIS AND RECOMMENDED FINDINGS OF FACT:** The Board accepted the findings of fact advanced by staff and the LPA.

C. VOTE:

JOHN ALBION

AYE

ANDREW COY

AYE

BOB JANES

AYE

RAY JUDAH

AYE

DOUG ST. CERNY

AYE

**PART V - DEPARTMENT OF COMMUNITY AFFAIRS OBJECTIONS,
RECOMMENDATIONS, AND COMMENTS (ORC) REPORT**

DATE OF ORC REPORT: _____

A. DCA OBJECTIONS, RECOMMENDATIONS AND COMMENTS

B. STAFF RESPONSE

**PART VI - BOARD OF COUNTY COMMISSIONERS
HEARING FOR ADOPTION OF PROPOSED AMENDMENT**

DATE OF ADOPTION HEARING: _____

A. BOARD REVIEW:

B. BOARD ACTION AND FINDINGS OF FACT SUMMARY:

1. BOARD ACTION:

2. BASIS AND RECOMMENDED FINDINGS OF FACT:

C. VOTE:

JOHN ALBION

ANDREW COY

BOB JANES

RAY JUDAH

DOUG ST. CERNY

**CPA2000-29
BoCC SPONSORED
AMENDMENT
TO THE**

LEE COUNTY COMPREHENSIVE PLAN

THE LEE PLAN

BoCC Public Hearing Document
for the
August 29, 2001 Public Hearing

*Lee County Planning Division
1500 Monroe Street
P.O. Box 398
Fort Myers, FL 33902-0398
(941) 479-8585*

August 1, 2001

**LEE COUNTY
DIVISION OF PLANNING
STAFF REPORT FOR
COMPREHENSIVE PLAN AMENDMENT
CPA2000-29**

☒

Text Amendment

☐

Map Amendment

✓	This Document Contains the Following Reviews:
✓	Staff Review
✓	Local Planning Agency Review and Recommendation
	Board of County Commissioners Hearing for Transmittal
	Staff Response to the DCA Objections, Recommendations, and Comments (ORC) Report
	Board of County Commissioners Hearing for Adoption

STAFF REPORT PREPARATION DATE: February 19, 2001

PART I - BACKGROUND AND STAFF RECOMMENDATION

A. SUMMARY OF APPLICATION

1. APPLICANT:

LEE COUNTY BOARD OF COUNTY COMMISSIONERS
REPRESENTED BY LEE COUNTY DIVISION OF PLANNING

2. REQUEST:

Evaluate adding a definition for the term "Natural Resource Extraction" to the Lee Plan Glossary. In addition, amend the Future Land Use Element by adding the term "Natural Resource Extraction" to Goal 10 and its Objectives and Policies, where applicable, clarifying that natural resources other than minerals are subject to Goal 10 requirements.

B. STAFF RECOMMENDATION AND FINDINGS OF FACT SUMMARY:

1. RECOMMENDATION: Planning staff recommends that the Board of County Commissioners transmit the proposed amendment as provided under Part III.B., the Revised Staff Analysis & Recommended Language portion of this report.

2. BASIS AND RECOMMENDED FINDINGS OF FACT:

- A broader term for mineral extraction is needed to clarify that natural resources other than minerals are subject to Goal 10 requirements.
- Principal resources sought in Lee County are sand, gravel, limestone, oil and gas which include both organic and inorganic materials.
- It should be ensured that all mined materials, organic and inorganic, are included under the language of Goal 10.
- The improved term, "Natural Resource Extraction," should be placed in the Lee Plan Glossary to support the new term.

C. BACKGROUND INFORMATION

This amendment was initiated by the Board of County Commissioners on September 19, 2000. The amendment stems from a suggested improvement to the Lee Plan by an LPA member. This issue was brought up during a public hearing in which the upcoming amendment cycle was being discussed and suggestions taken. The proposal was for staff to evaluate Goal 10, Mineral Extraction, and its references to limerock. This member of the LPA noted that technically limerock is not a mineral, but is an organic material and suggested adding improved language such as a definition for natural resource extraction.

PART II - STAFF ANALYSIS

A. STAFF DISCUSSION

Goal 10 and its Objective and Policies address the extractive industry in Lee County and provides for the protection of natural resources, such as mineral resources, while limiting the potential adverse effects associated with the extraction of such resources. Goal 10, Objective 10.1, and the policies that follow are reproduced below:

GOAL 10: MINERAL EXTRACTION. *To protect areas containing identified mineral resources from incompatible urban development, while insuring that extraction operations minimize or eliminate adverse effects on surrounding land use and natural resources.*

OBJECTIVE 10.1: *Designate through the rezoning process sufficient lands suitable for providing fill material and limerock to meet the county's needs and to export to other communities, while providing adequate protection for the county's natural resources. (Amended by Ordinance No. 94-30)*

POLICY 10.1.1: *Mineral extraction operations intending to withdraw groundwater for any purpose must provide a monitoring system to measure groundwater impacts.*

POLICY 10.1.2: *Applications for mineral extraction permits for new or expanding areas must include an environmental assessment. The assessment will include (but not be limited to) consideration of air emissions, impact on environmental and natural resources, effect on nearby land uses, degradation of water quality, depletion of water quantity, drainage, fire and safety, noise, odor, visual impacts, transportation including access roads, sewage disposal, and solid waste disposal. (Amended by Ordinance No. 00-22)*

POLICY 10.1.3: *Applications for mineral extraction permits for new or expanding sites must include a reclamation plan which provides assurance of implementation. Reclamation plans in or near important groundwater resource areas must be designed to minimize the possibility of contamination of the groundwater during mining and after completion of the reclamation. (Amended by Ordinance No. 00-22)*

POLICY 10.1.4: *Mineral extraction activities (and industrial uses which are ancillary to mineral extraction) may be permitted in areas indicated on the Future Land Use Map as Rural, Open Lands, and Density Reduction/Groundwater Resources, provided they have adequate fire protection, transportation facilities, wastewater treatment and water supply, and provided further that they have no significant adverse effects such as dust and noise on surrounding land uses and natural resources. In order to reduce transport costs and minimize wear on the county's roadways, the extraction and transport of fill material may also be permitted as an interim use in the Future Urban Areas provided that the above requirements are met; however, special restrictions may also be applied to protect other land uses. These determinations will be made during the rezoning process. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 10.1.5: *Lee County will support efforts by government, community leaders, and the rock mining industry owners and businesses to seek incentives that will help to facilitate the connection of rock mining borrow lake excavations into a system of interconnected lakes and flowways that will enhance wildlife habitat values, provide for human recreation, educational and other appropriate uses, and/or strengthen community environmental benefits. (Added by Ordinance No. 99-15)*

The Goal provides specific language for the protection of mineral resources, the protection of surrounding land uses, reclamation, the prevention of the degradation of environmental resources and existing infrastructure, and provides language on the enhancement of the environment as an end result of extraction activities. The principal resources sought in Lee County, pertaining to the extraction industry, are sand, gravel, limestone, oil, and gas. These resources include both organic and inorganic materials according to the following two definitions of "mineral" and "limestone" taken from the Dictionary of Natural Resource Management (1996):

MINERAL *A non-technical word more specifically defined by legislation, usually involving one or more of the following: (1) a scientifically recognized inorganic material; (2) a material classified commercially as a mineral; (3) a material derived from the earth that possesses economic value and utility aside from the agricultural purposes of the land surface itself.*

Minerals include sand, gravel (common minerals), precious or semi-precious stones, coal, petroleum resources, and natural gas, even though the latter three are not inorganic. Some definitions limit the term to inorganic materials having a distinct chemical composition, characteristic crystalline structure, colour, and hardness.

LIMESTONE *A sedimentary rock consisting mainly (greater than 50 per cent) of calcium carbonate, typically as calcite. Limestone is formed by a combination of organic and inorganic processes and includes chemical and clastic (soluble and insoluble) constituents. Many forms of limestone contain fossils.*

Staff has evaluated Goal 10 and its Objectives and Policies, where applicable, and concur that a broader term for mineral extraction is needed to clarify that natural resources other than minerals are subject to Goal 10 requirements. Staff has evaluated the term *natural resource extraction* and also concurs that this would be the best term to ensure the inclusion of all materials, organic and inorganic, sought by the extractive industry. Throughout the language under Goal 10, mineral extraction, limerock, and rock mining are referenced.

Mining and fill dirt operations are required elements in a well balanced economy. Such operations provide fill allowing development to occur and provide raw materials for many other products. The proposed amendment will correct and bring all of the resources intended to be regulated under the Goal under unified terminology. Staff is proposing to add a definition of *natural resource extraction* to the Lee Plan Glossary.

In addition to the broader term and Glossary definition, staff is recommending that the term rock mining industry in Policy 10.1.5 be replaced with the term extractive industry. This will allow the language of the policy to include all types of mining. Staff is also recommending that Policy 1.1.7, Policy 1.4.5, and Policy 9.1.4 of the Future Land Use Element, which include references to mineral extraction, be amended to include the proposed term *natural resource extraction*.

B. CONCLUSIONS

Goal 10 and its Objectives and Policies give specific language in regards to extraction requirements yet refers only to mineral extraction. In light of the fact that limerock is a major resource found within the County but would not technically fall under the term "mineral" due to its organic properties, staff is proposing that the term *natural resource extraction* be adopted to replace the references to mineral extraction. Staff also proposes a definition in the Lee Plan Glossary to support the new term and also proposes the replacement of references to mineral extraction in Policy 1.1.7, Policy 1.4.5, and Policy 9.1.4 of the Future Land Use Element.

C. STAFF RECOMMENDATION

Planning staff recommends that the Board of County Commissioners transmit the proposed plan amendment. The proposed language is as follows.

GOAL 10: ~~MINERAL~~ NATURAL RESOURCE EXTRACTION. To protect areas containing identified ~~mineral~~ natural resources from incompatible urban development, while insuring that natural resource extraction operations minimize or eliminate adverse effects on surrounding land use and natural resources.

OBJECTIVE 10.1: Designate through the rezoning process sufficient lands suitable for providing fill material, ~~and limerock, and other natural resource extraction materials~~ to meet the county's needs and to export to other communities, while providing adequate protection for the county's natural resources. (Amended by Ordinance No. 94-30)

POLICY 10.1.1: ~~Mineral~~ Natural resource extraction operations intending to withdraw groundwater for any purpose must provide a monitoring system to measure groundwater impacts.

POLICY 10.1.2: Applications for ~~mineral~~ natural resource extraction permits for new or expanding areas must include an environmental assessment. The assessment will include (but not be limited to) consideration of air emissions, impact on environmental and natural resources, effect on nearby land uses, degradation of water quality, depletion of water quantity, drainage, fire and safety, noise, odor, visual impacts, transportation including access roads, sewage disposal, and solid waste disposal. (Amended by Ordinance No. 00-22)

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POLICY 10.1.4: ~~Mineral~~ Natural resource extraction activities (and industrial uses which are ancillary to ~~mineral natural resource~~ extraction) may be permitted in areas indicated on the Future Land Use Map as Rural, Open Lands, and Density Reduction/Groundwater Resources, provided they have adequate fire protection, transportation facilities, wastewater treatment and water supply, and provided further that they have no significant adverse effects such as dust and noise on surrounding land uses and natural resources. In order to reduce transport costs and minimize wear on the county's roadways, the extraction and transport of fill material may also be permitted as an interim use in the Future Urban Areas provided that the above requirements are met; however, special restrictions may also be applied to protect other land uses. These determinations will be made during the rezoning process. (Amended by Ordinance No. 94-30, 00-22)

POLICY 10.1.5: Lee County will support efforts by government, community leaders, and the ~~rock mining~~ extractive industry owners and businesses to seek incentives that will help to facilitate the connection of ~~rock mining natural resource extraction~~ borrow lake excavations into a system of interconnected lakes and flowways that will enhance wildlife habitat values, provide for human recreation, educational and other appropriate uses, and/or strengthen community environmental benefits. (Added by Ordinance No. 99-15)

OBJECTIVE 10.2: Determine and maintain a balance between the County's petroleum resources and the health, safety and welfare of the residents of its Future Urban Areas. (Added by Ordinance No. 98-09)

POLICY 10.2.1: By 2000, the county will conduct a study to determine the appropriateness of oil exploration, drilling, or production. The study will address the issues of the compatibility of oil-related activities with the environment and urban uses. This study will include recommendations regarding the appropriateness of such activities within Lee County as well as guidelines under which such activities should be regulated under the Lee County Land Development Code. (Added by Ordinance No. 98-09, Amended by Ordinance No. 00-22)

Glossary Term:

NATURAL RESOURCE EXTRACTION - The act of extracting, through various techniques, renewable and non-renewable resources in their natural state on or below the surface of the earth.

Additional Policies:

POLICY 1.1.7: The Industrial Development areas play an important role in strengthening the county's economic base and will become increasingly important as the county grows in size and urban complexity. To a great extent these are the areas to which Lee County must look for expanded job opportunities, investments and production opportunities, and a balanced and sufficient tax base. These areas have special locational requirements that are more stringent than those for residential areas, including transportation needs (e.g., air, rail, highway); industrial levels of water, sewer, fire protection, and other urban services; and locations that are convenient for employees to reach. Whereas the other Future Urban Areas will include a broad combination of residential, commercial, public, and limited industrial land uses, the Industrial Development area is to be reserved mainly for industrial activities per se, as well as for selective land use mixtures such as the combined uses of industrial, manufacturing, research, properly buffered recreational uses (except where precluded by airport hazard zone regulations), and office complexes (if specifically related to adjoining industrial uses) that constitute a growing part of Florida's economic development sector. New ~~mineral natural resource~~ extraction (mining) activities and fill dirt operations must be approved through the Industrial Planned Development rezoning process. Retail or wholesale of products manufactured or processed upon the premises may be allowed at a ratio of 1 square foot of commercial uses to 10 square feet of industrial use in association with a Planned Development. Ancillary minor retail commercial uses intended to support the surrounding industrial land uses may not exceed 30,000 square feet per development; and, at buildout, may not exceed more than ten percent (10%) of the total acreage of the lands designated as Industrial Development areas in each community outlined in Map

16. Residential uses, other than bona fide caretaker residences, are not permitted in this category except to the extent provided in Chapter XIII of the Plan. (Amended by Ordinance No. 94-30, 98-09, 99-15)

POLICY 1.4.5: The Density Reduction/Groundwater Resource (DR/GR) areas include upland areas that provide substantial recharge to aquifers most suitable for future wellfield development. These areas also are the most favorable locations for physical withdrawal of water from those aquifers. Only minimal public facilities exist or are programmed. Land uses in these areas must be compatible with maintaining surface and groundwater levels at their historic levels. Permitted land uses include agriculture, ~~mineral or limestone~~ natural resource extraction and related facilities, conservation uses, publicly-owned gun range facilities, private recreation facilities, and residential uses at a maximum density of one dwelling unit per ten acres (1 du/10 acres). Individual residential parcels may contain up to two acres of Wetlands without losing the right to have a dwelling unit, provided that no alterations are made to those wetland areas. (Amended by Ordinance 91-19, 94-30, 99-16)

POLICY 9.1.4: Protect agricultural activities on lands designated as Agricultural on the agricultural overlay from the impacts of new ~~mineral~~ natural resource extraction operations, recreational uses, and residential developments. (Amended by Ordinance No. 94-30)

PART III - LOCAL PLANNING AGENCY REVIEW AND RECOMMENDATION

DATE OF PUBLIC HEARING: February 26, 2001

A. LOCAL PLANNING AGENCY REVIEW

Staff presented this amendment before the LPA on February 26, 2001. After some discussion the LPA voted to continue the amendment. One member of the LPA asked for examples of materials that would fall under the definition. Staff noted that sand, gravel, limestone, oil, and gas are some of the most sought out resources in the county. Another member noted there are other materials sought after and suggested staff add language to the glossary term providing examples but not limiting the term to only these materials. Another member of the LPA noted that the glossary term should not be defined with the same words used within the term (extraction) and suggested this be changed. Another member of the LPA questioned if water had been given proper consideration with the proposed changes, due to the fact that water is also a natural resource. A motion was called and carried to continue the amendment until water can be reviewed and given adequate consideration under the context of the proposed amendment.

B. REVISED STAFF ANALYSIS & RECOMMENDED LANGUAGE

Staff has evaluated the concerns of the LPA and offer the revised language provided below. In order to address the word *extraction* within the proposed glossary term staff has replaced it with the word *removing*. According to Black's Law Dictionary the word *removal* is defined as follows:

***Removal** - In a broad sense, the transfer of a person, thing, or case from one place to another.*

In this case the word would be relating to the transfer of a thing, a natural resource, from one place to another. Staff finds that the word *removing* would be a clear and concise word to be included in the glossary term, replacing the word *extraction*.

Staff has also reviewed water under the context of the amendment. There are sufficient safeguards contained within the Lee Plan, the County's plan amendment application, and the Land Development Code in addition to South Florida Water Management District rules protecting and regulating water supply. In addition, after discussions with Lee County Natural Resource staff, it is commonly perceived that the removal of water is considered in conjunction with the term withdrawal, rather than the term extraction.

Lee Plan

The Lee Plan provides language addressing critical areas for future water supply, the protection of such critical areas, the staff appointed for reviewing proposed development near public utility wellfields, coordination with and criteria set forth by the SFWMD, identifying water pollutant sources, identifying water needs, inspections, the wellfield protection ordinance, and avoidance of premature urbanization. Following are the Goals, Objectives, and Policies from the Future Land Use, Community Facilities and Services, Conservation and Coastal Management, and Housing elements of the Lee Plan which provide the language noted above:

***POLICY 2.4.2:** All proposed changes to the Future Land Use Map in critical areas for future potable water supply (Bonita Springs as described in Policy 13.2.2; Lehigh Acres as described in Policy 34.1.9; and all land in the Density Reduction/ Groundwater Resource land use category) will be subject to a special review by the staff of Lee County. This review will analyze the proposed land uses to determine the short-term and long-term availability of irrigation and domestic water sources, and will assess whether the proposed land uses would cause any significant*

impact on present or future water resources. If the Board of County Commissioners wishes to approve any such changes to the Future Land Use Map, it must make a formal finding that no significant impacts on present or future water resources will result from the change. (Amended by Ordinance No. 92-47) (Amended by Ordinance No. 94-30, 00-22)

POLICY 2.4.3: Future Land Use Map Amendments to the existing DR/GR areas south of SR 82 east of I-75, excluding areas designated by the Port Authority as needed for airport expansion, which increase the current allowable density or intensity of land use will be discouraged by the county. It is Lee County's policy not to approve further urban designations there for the same reasons that supported its 1990 decision to establish this category. In addition to satisfying the requirements in 163 Part II Florida Statutes, Rule 9J-5 of the Florida Administrative Code, the Strategic Regional Policy Plan, the State Comprehensive Plan, and all of the criteria in the Lee Plan, applicants seeking such an amendment must:

1. analyze the proposed allowable land uses to determine the availability of irrigation and domestic water sources; and,
2. identify potential irrigation and domestic water sources, consistent with the Regional Water Supply Plan. Since regional water suppliers cannot obtain permits consistent with the planning time frame of the Lee Plan, water sources do not have to be currently permitted and available, but they must be reasonably capable of being permitted; and,
3. present data and analysis that the proposed land uses will not cause any significant harm to present and future public water resources; and,
4. supply data and analysis specifically addressing the urban sprawl criteria listed in Rule 9J-5.006(5) (g), (h), (i) and (j), FAC.

During the transmittal and adoption process, the Board of County Commissioners must review the application for all these analytical requirements and make a finding that the amendment complies with all of them. (Added by Ordinance No. 97-05)

POLICY 13.2.2: IRRIGATION WELLS. Bonita Springs (as defined in this plan) is hereby declared a critical area for future potable water supply, based on evidence that withdrawals from the main potable aquifer, the lower Tamiami aquifer, are approaching or exceeding the maximum safe yield. In response to this designation, the county will maintain current regulations to provide that new irrigation well permits in Bonita Springs may not utilize the main potable water source. (Also see Policy 34.1.9 for new permit requirements for wells in Lehigh Acres, and Policy 2.4.2 for special requirements for amendments to the Future Land Use Map.) (Amended by Ordinance No. 94-30, 00-22)

POLICY 16.4.8: If a proposed Private Recreation Facilities falls within an area identified as anticipated drawdown zone for existing or future public well development, the project must utilize an alternative water supply such as reuse or withdrawal from a different non-competing aquifer or show that adequate supply is available in excess of that being used for planned public water supply development. (Added by Ordinance No. 99-16)

POLICY 35.1.2: The Lee County Regional Water Supply Authority will plan and coordinate with all member governments in the development of comprehensive plans as they relate to wellfield protection, aquifer recharge, water supply, and related capital facilities. (Added by Ordinance No. 00-22)

POLICY 35.1.3: The Lee County Regional Water Supply Authority will perform groundwater modeling and analysis for new development, as requested by the member governments, to assess the potential impact on the water resources of member governments. The analysis will focus on the following issues:

- Adequacy of water supply, including groundwater level draw-down
- Avoidance of adverse impacts on natural systems from water supply withdrawals.

(Added by Ordinance No. 00-22)

e. Groundwater Recharge

GOAL 43: GROUNDWATER. *To protect the county's groundwater supplies from those activities having the potential for depleting or degrading those supplies.*

OBJECTIVE 43.1: WELLFIELD PROTECTION. *The county will maintain a wellfield protection ordinance to provide regulations protecting the quality of water flowing into potable water wellfields. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 43.1.1: *The wellfield protection ordinance will be amended whenever better technical data is developed and whenever additional potable wellfields are proposed. (Amended by Ordinance No. 00-22)*

POLICY 43.1.2: *The staff hydrogeologist will review and comment on all development applications near public utility potable water wellfields, with particular attention to proposed land uses within a 10-year travel time from the wellheads. (Amended by Ordinance No. 00-22)*

OBJECTIVE 43.2: POTABLE GROUNDWATER. *Base all future development and use of groundwater resources on determinations of the safe yield of the aquifer system(s) in order not to impair the native groundwater quality or create other environmental damage. Criteria for safe-yield determinations will be determined by the SFWMD, the agency charged with permitting these activities. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 43.2.1: *For maximum protection of groundwater resources, identify future wellfields and/or relocation site(s) for existing wellfields well in advance of need. Coordinate with SFWMD, other water suppliers, and DEP to avoid duplication and to assist in data collection and interchange. (Amended by Ordinance No. 94-30)*

POLICY 43.2.2: *Institute a program to identify sources of groundwater pollutants in Lee County and to map these (point and non-point) on a county-wide basis.*

POLICY 43.2.3: *Identify water needs consistent with projections of human population and the needs of natural systems in order to determine the future demands for groundwater. (Amended by Ordinance No. 94-30)*

POLICY 43.2.4: *Expand current programs to identify and map the contamination potential of groundwater resources for those areas of Lee County not currently under public ownership.*

POLICY 43.2.5: *Lee County, in cooperation with other agencies and the municipalities, will budget to maintain its current program of plugging non- valved, abandoned, or improperly-cased artesian wells so that at least seventy-five of these wells are plugged each year until such wells are eliminated. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 85.1.7: *Valid permits and inspection shall be required prior and subsequent to drilling operations for wells, elevator shafts, foundation holes, and test borings.*

POLICY 85.1.8: *The county shall continue its program of plugging improperly constructed wells which are detrimental to groundwater resources. (Amended by Ordinance No. 94-30)*

POLICY 100.9.7: *The county shall coordinate residential development within urban areas to coincide with existing or planned and programmed services and facilities so as to avoid premature or non-contiguous urbanization and the use of septic tanks and private wells for potable water within developed urban areas.*

Plan Amendment Application

Lee County's application for a comprehensive plan amendment requests various forms of support documentation under Part IV of the application. Section F of Part IV provides for additional requirements for specific amendments. Under this section #3 requires requests involving lands in critical areas be evaluated based on Policy 2.4.2. Part IV.F.3. is reproduced below:

3. Requests involving lands in critical areas for future water supply must be evaluated based on policy 2.4.2.

Wellfield Protection Ordinance

The wellfield protection ordinance (Ordinance No. 95-01) was adopted by the Lee County Board of County Commissioners in 1995 and is located under Article III, Section 14-201 through 14-258 of the Land Development Code. The intent of the article, under Section 14-202(b), is reproduced below:

b) The intent of this article is further to safeguard the public health, safety and welfare of the residents of the county by providing criteria for the regulation of activities which may allow the entrance of brackish water into identified protection zones surrounding existing wellfields, and prohibiting or regulating hazardous or toxic substances within identified protection zones surrounding such wellfields, thereby protecting existing public potable water supply wells from contamination. The provisions of this article apply only to the unincorporated areas of the county.

The article establishes and defines four types of wellfield protection zones and adopts protection zone maps. Under Section 14-214, titled *prohibited and regulated activities within protection zones*, earth mining within a 500-foot radius of an existing wellhead is prohibited. Also under this section of the article all protection zones, 1 through 4, are regulated that any stormwater or surface water discharge within the zones will conform to existing South Florida Water Management District and State Department of Environmental Protection rules.

Staff has reviewed and evaluated the natural resource water under the context of the proposed amendment and has determined that there is significant documentation regarding the protection and regulation of this natural resource. All of the County's regulating documents discussed above in addition to the South Florida Water Management Districts regulations, provide standards and prohibitions on the withdrawal of groundwater and the impacts of development and activities on the County's water resources. Staff has concluded that although water is a natural resource the proposed glossary term should exclude this natural resource due to the fact that it is adequately addressed through other regulations and the fact that Goal 10 and its Objectives and Policies primarily concentrate on the extraction of materials, rather than the withdrawal of groundwater.

The revised language to the Glossary term is as follows. No other changes have been made to the initial proposal also shown below. New changes to the proposed term are shown in strike through and double underlining.

Glossary Term:

NATURAL RESOURCE EXTRACTION - The act of ~~extracting~~ removing, through various techniques, renewable and non-renewable resources, excluding water, in their natural state on or below the surface of the earth. Such resources include but are not limited to sand, gravel, limestone, fill dirt, oil, and natural gas.

GOAL 10: ~~MINERAL~~ NATURAL RESOURCE EXTRACTION. To protect areas containing identified ~~mineral~~ natural resources from incompatible urban development, while insuring that natural resource extraction operations minimize or eliminate adverse effects on surrounding land use and natural resources.

OBJECTIVE 10.1: Designate through the rezoning process sufficient lands suitable for providing fill material, and limerock, and other natural resource extraction materials to meet the county's needs and to export to other communities, while providing adequate protection for the county's natural resources. (Amended by Ordinance No. 94-30)

POLICY 10.1.1: ~~Mineral~~ Natural resource extraction operations intending to withdraw groundwater for any purpose must provide a monitoring system to measure groundwater impacts.

POLICY 10.1.2: Applications for ~~mineral~~ natural resource extraction permits for new or expanding areas must include an environmental assessment. The assessment will include (but not be limited to) consideration of air emissions, impact on environmental and natural resources, effect on nearby land uses, degradation of water quality, depletion of water quantity, drainage, fire and safety, noise, odor, visual impacts, transportation including access roads, sewage disposal, and solid waste disposal. (Amended by Ordinance No. 00-22)

POLICY 10.1.3: Applications for ~~mineral~~ natural resource extraction permits for new or expanding sites must include a reclamation plan which provides assurance of implementation. Reclamation plans in or near important groundwater resource areas must be designed to minimize the possibility of contamination of the groundwater during mining and after completion of the reclamation. (Amended by Ordinance No. 00-22)

POLICY 10.1.4: ~~Mineral~~ Natural resource extraction activities (and industrial uses which are ancillary to ~~mineral~~ natural resource extraction) may be permitted in areas indicated on the Future Land Use Map as Rural, Open Lands, and Density Reduction/Groundwater Resources, provided they have adequate fire protection, transportation facilities, wastewater treatment and water supply, and provided further that they have no significant adverse effects such as dust and noise on surrounding land uses and natural resources. In order to reduce transport costs and minimize wear on the county's roadways, the extraction and transport of fill material may also be permitted as an interim use in the Future Urban Areas provided that the above requirements are met; however, special restrictions may also be applied to protect other land uses. These determinations will be made during the rezoning process. (Amended by Ordinance No. 94-30, 00-22)

POLICY 10.1.5: Lee County will support efforts by government, community leaders, and the ~~rock mining~~ extractive industry owners and businesses to seek incentives that will help to facilitate the connection of ~~rock-mining~~ natural resource extraction borrow lake excavations into a system of interconnected lakes and flowways that will enhance wildlife habitat values, provide for human recreation, educational and other appropriate uses, and/or strengthen community environmental benefits. (Added by Ordinance No. 99-15)

OBJECTIVE 10.2: Determine and maintain a balance between the County's petroleum resources and the health, safety and welfare of the residents of its Future Urban Areas. (Added by Ordinance No. 98-09)

POLICY 10.2.1: By 2000, the county will conduct a study to determine the appropriateness of oil exploration, drilling, or production. The study will address the issues of the compatibility of oil-related activities with the environment and urban uses. This study will include recommendations regarding the appropriateness of such activities within Lee County as well as guidelines under which such activities should be regulated under the Lee County Land Development Code. (Added by Ordinance No. 98-09, Amended by Ordinance No. 00-22)

Additional Policies:

POLICY 1.1.7: The Industrial Development areas play an important role in strengthening the county's economic base and will become increasingly important as the county grows in size and urban complexity. To a great extent these are the areas to which Lee County must look for expanded job opportunities, investments and production opportunities, and a balanced and sufficient tax base. These areas have special locational requirements that are more stringent than those for residential areas, including transportation needs (e.g., air, rail, highway); industrial levels of water, sewer, fire protection, and other urban services; and locations that are convenient for employees to reach. Whereas the other Future Urban Areas will include a broad combination of residential, commercial, public, and limited industrial land uses, the Industrial Development area is to be reserved mainly for industrial activities per se, as well as for selective land use mixtures such as the combined uses of industrial, manufacturing, research, properly buffered recreational uses (except where precluded by airport hazard zone regulations), and office complexes (if specifically related to adjoining industrial uses) that constitute a growing part of Florida's economic development sector. New ~~mineral~~ natural resource extraction (mining) activities and fill dirt operations must be approved through the Industrial Planned Development rezoning process. Retail or wholesale of products manufactured or processed upon the premises may be allowed at a ratio of 1 square foot of commercial uses to 10 square feet of industrial use in association with a Planned Development. Ancillary minor retail commercial uses intended to support the surrounding industrial land uses may not exceed 30,000 square feet per development; and, at buildout, may not exceed more than ten percent (10%) of the total acreage of the lands designated as Industrial Development areas in each community outlined in Map 16. Residential uses, other than bona fide caretaker residences, are not permitted in this category except to the extent provided in Chapter XIII of the Plan. (Amended by Ordinance No. 94-30, 98-09, 99-15)

POLICY 1.4.5: The Density Reduction/Groundwater Resource (DR/GR) areas include upland areas that provide substantial recharge to aquifers most suitable for future wellfield development. These areas also are the most favorable locations for physical withdrawal of water from those aquifers. Only minimal public facilities exist or are programmed. Land uses in these areas must be compatible with maintaining surface and groundwater levels at their historic levels. Permitted land uses include agriculture, ~~mineral~~ or limestone natural resource extraction and related facilities, conservation uses, publicly-owned gun range facilities, private recreation facilities, and residential uses at a maximum density of one dwelling unit per ten acres (1 du/10 acres). Individual residential parcels may contain up to two acres of Wetlands without losing the right to have a dwelling unit, provided that no alterations are made to those wetland areas. (Amended by Ordinance 91-19, 94-30, 99-16)

POLICY 9.1.4: Protect agricultural activities on lands designated as Agricultural on the agricultural overlay from the impacts of new ~~mineral~~ natural resource extraction operations, recreational uses, and residential developments. (Amended by Ordinance No. 94-30)

**LOCAL PLANNING AGENCY
REVIEW AND RECOMMENDATION**

DATE OF PUBLIC HEARING: March 26, 2001

C. LOCAL PLANNING AGENCY REVIEW

Staff presented this amendment before the LPA on March 26, 2001. Staff clarified the changes made to the proposed language since it had been presented before the LPA in February. The LPA provided no discussion concerning the proposed amendment.

D. LOCAL PLANNING AGENCY RECOMMENDATION AND FINDINGS OF FACT SUMMARY

1. **RECOMMENDATION:** The LPA recommends that the Board of County Commissioners transmit this amendment.
2. **BASIS AND RECOMMENDED FINDINGS OF FACT:** The LPA accepted the findings of fact as advanced by the staff.

E. VOTE:

NOEL ANDRESS	_____ AYE
SUSAN BROOKMAN	_____ AYE
BARRY ERNST	_____ AYE
RONALD INGE	_____ AYE
GORDON REIGELMAN	_____ AYE
VIRGINIA SPLITT	_____ ABSENT
GREG STUART	_____ AYE

**PART IV - BOARD OF COUNTY COMMISSIONERS
HEARING FOR TRANSMITTAL OF PROPOSED AMENDMENT**

DATE OF TRANSMITTAL HEARING: August 29, 2001

A. BOARD REVIEW:

B. BOARD ACTION AND FINDINGS OF FACT SUMMARY:

1. BOARD ACTION:

2. BASIS AND RECOMMENDED FINDINGS OF FACT:

C. VOTE:

JOHN ALBION

ANDREW COY

BOB JANES

RAY JUDAH

DOUG ST. CERNY

DATE OF ORC REPORT: _____

- August 1, 2001
PAGE 16 OF 17

**PART VI - BOARD OF COUNTY COMMISSIONERS
HEARING FOR ADOPTION OF PROPOSED AMENDMENT**

DATE OF ADOPTION HEARING: _____

A. BOARD REVIEW:

B. BOARD ACTION AND FINDINGS OF FACT SUMMARY:

1. BOARD ACTION:

2. BASIS AND RECOMMENDED FINDINGS OF FACT:

C. VOTE:

JOHN ALBION

ANDREW COY

BOB JANES

RAY JUDAH

DOUG ST. CERNY

**CPA2000-29
BoCC SPONSORED
AMENDMENT
TO THE**

LEE COUNTY COMPREHENSIVE PLAN

THE LEE PLAN

**LPA Public Hearing Document
for the
March 26th, 2001 Public Hearing**

*Lee County Planning Division
1500 Monroe Street
P.O. Box 398
Fort Myers, FL 33902-0398
(941) 479-8585*

March 19, 2001

**LEE COUNTY
DIVISION OF PLANNING
STAFF REPORT FOR
COMPREHENSIVE PLAN AMENDMENT
CPA2000-29**

☒

Text Amendment

☐

Map Amendment

<input checked="" type="checkbox"/>	This Document Contains the Following Reviews:
<input checked="" type="checkbox"/>	Staff Review
<input type="checkbox"/>	Local Planning Agency Review and Recommendation
<input type="checkbox"/>	Board of County Commissioners Hearing for Transmittal
<input type="checkbox"/>	Staff Response to the DCA Objections, Recommendations, and Comments (ORC) Report
<input type="checkbox"/>	Board of County Commissioners Hearing for Adoption

STAFF REPORT PREPARATION DATE: February 19, 2001

PART I - BACKGROUND AND STAFF RECOMMENDATION

A. SUMMARY OF APPLICATION

1. APPLICANT:

LEE COUNTY BOARD OF COUNTY COMMISSIONERS
REPRESENTED BY LEE COUNTY DIVISION OF PLANNING

2. REQUEST:

Evaluate adding a definition for the term "Natural Resource Extraction" to the Lee Plan Glossary. In addition, amend the Future Land Use Element by adding the term "Natural Resource Extraction" to Goal 10 and its Objectives and Policies, where applicable, clarifying that natural resources other than minerals are subject to Goal 10 requirements.

B. STAFF RECOMMENDATION AND FINDINGS OF FACT SUMMARY:

1. RECOMMENDATION: Planning staff recommends that the Board of County Commissioners transmit the proposed amendment as provided under Part C, the Staff Recommendation portion of this report.

2. BASIS AND RECOMMENDED FINDINGS OF FACT:

- A broader term for mineral extraction is needed to clarify that natural resources other than minerals are subject to Goal 10 requirements.
- Principal resources sought in Lee County are sand, gravel, limestone, oil and gas which include both organic and inorganic materials.
- It should be ensured that all mined materials, organic and inorganic, are included under the language of Goal 10.
- The improved term, "Natural Resource Extraction," should be placed in the Lee Plan Glossary to support the new term.

C. BACKGROUND INFORMATION

This amendment was initiated by the Board of County Commissioners on September 19, 2000. The amendment stems from a suggested improvement to the Lee Plan by an LPA member. This issue was brought up during a public hearing in which the upcoming amendment cycle was being discussed and suggestions taken. The proposal was for staff to evaluate Goal 10, Mineral Extraction, and its references to limerock. This member of the LPA noted that technically limerock is not a mineral, but is an organic material and suggested adding improved language such as a definition for natural resource extraction.

PART II - STAFF ANALYSIS

A. STAFF DISCUSSION

Goal 10 and its Objective and Policies address the extractive industry in Lee County and provides for the protection of natural resources, such as mineral resources, while limiting the potential adverse effects associated with the extraction of such resources. Goal 10, Objective 10.1, and the policies that follow are reproduced below:

GOAL 10: MINERAL EXTRACTION. *To protect areas containing identified mineral resources from incompatible urban development, while insuring that extraction operations minimize or eliminate adverse effects on surrounding land use and natural resources.*

OBJECTIVE 10.1: *Designate through the rezoning process sufficient lands suitable for providing fill material and limerock to meet the county's needs and to export to other communities, while providing adequate protection for the county's natural resources. (Amended by Ordinance No. 94-30)*

POLICY 10.1.1: *Mineral extraction operations intending to withdraw groundwater for any purpose must provide a monitoring system to measure groundwater impacts.*

POLICY 10.1.2: *Applications for mineral extraction permits for new or expanding areas must include an environmental assessment. The assessment will include (but not be limited to) consideration of air emissions, impact on environmental and natural resources, effect on nearby land uses, degradation of water quality, depletion of water quantity, drainage, fire and safety, noise, odor, visual impacts, transportation including access roads, sewage disposal, and solid waste disposal. (Amended by Ordinance No. 00-22)*

POLICY 10.1.3: *Applications for mineral extraction permits for new or expanding sites must include a reclamation plan which provides assurance of implementation. Reclamation plans in or near important groundwater resource areas must be designed to minimize the possibility of contamination of the*

groundwater during mining and after completion of the reclamation. (Amended by Ordinance No. 00-22)

POLICY 10.1.4: Mineral extraction activities (and industrial uses which are ancillary to mineral extraction) may be permitted in areas indicated on the Future Land Use Map as Rural, Open Lands, and Density Reduction/Groundwater Resources, provided they have adequate fire protection, transportation facilities, wastewater treatment and water supply, and provided further that they have no significant adverse effects such as dust and noise on surrounding land uses and natural resources. In order to reduce transport costs and minimize wear on the county's roadways, the extraction and transport of fill material may also be permitted as an interim use in the Future Urban Areas provided that the above requirements are met; however, special restrictions may also be applied to protect other land uses. These determinations will be made during the rezoning process. (Amended by Ordinance No. 94-30, 00-22)

POLICY 10.1.5: Lee County will support efforts by government, community leaders, and the rock mining industry owners and businesses to seek incentives that will help to facilitate the connection of rock mining borrow lake excavations into a system of interconnected lakes and flowways that will enhance wildlife habitat values, provide for human recreation, educational and other appropriate uses, and/or strengthen community environmental benefits. (Added by Ordinance No. 99-15)

The Goal provides specific language for the protection of mineral resources, the protection of surrounding land uses, reclamation, the prevention of the degradation of environmental resources and existing infrastructure, and provides language on the enhancement of the environment as an end result of extraction activities. The principal resources sought in Lee County, pertaining to the extraction industry, are sand, gravel, limestone, oil, and gas. These resources include both organic and inorganic materials according to the following two definitions of "mineral" and "limestone" taken from the Dictionary of Natural Resource Management (1996):

MINERAL A non-technical word more specifically defined by legislation, usually involving one or more of the following: (1) a scientifically recognized inorganic material; (2) a material classified commercially as a mineral; (3) a material derived from the earth that possesses economic value and utility aside from the agricultural purposes of the land surface itself.

Minerals include sand, gravel (common minerals), precious or semi-precious stones, coal, petroleum resources, and natural gas, even though the latter three are not inorganic. Some definitions limit the term to inorganic materials having a distinct chemical composition, characteristic crystalline structure, colour, and hardness.

LIMESTONE A sedimentary rock consisting mainly (greater than 50 per cent) of calcium carbonate, typically as calcite. Limestone is formed by a combination of organic and inorganic processes and includes chemical and clastic (soluble and insoluble) constituents. Many forms of limestone contain fossils.

Staff has evaluated Goal 10 and its Objectives and Policies, where applicable, and concur that a broader term for mineral extraction is needed to clarify that natural resources other than minerals are subject to Goal 10 requirements. Staff has evaluated the term *natural resource extraction* and also concurs that this would be the best term to ensure the inclusion of all materials, organic and inorganic, sought by the extractive industry. Throughout the language under Goal 10, mineral extraction, limerock, and rock mining are referenced.

Mining and fill dirt operations are required elements in a well balanced economy. Such operations provide fill allowing development to occur and provide raw materials for many other products. The proposed amendment will correct and bring all of the resources intended to be regulated under the Goal under unified terminology. Staff is proposing to add a definition of *natural resource extraction* to the Lee Plan Glossary.

In addition to the broader term and Glossary definition, staff is recommending that the term rock mining industry in Policy 10.1.5 be replaced with the term extractive industry. This will allow the language of the policy to include all types of mining. Staff is also recommending that Policy 1.1.7, Policy 1.4.5, and Policy 9.1.4 of the Future Land Use Element, which include references to mineral extraction, be amended to include the proposed term *natural resource extraction*.

B. CONCLUSIONS

Goal 10 and its Objectives and Policies give specific language in regards to extraction requirements yet refers only to mineral extraction. In light of the fact that limerock is a major resource found within the County but would not technically fall under the term "mineral" due to its organic properties, staff is proposing that the term *natural resource extraction* be adopted to replace the references to mineral extraction. Staff also proposes a definition in the Lee Plan Glossary to support the new term and also proposes the replacement of references to mineral extraction in Policy 1.1.7, Policy 1.4.5, and Policy 9.1.4 of the Future Land Use Element.

C. STAFF RECOMMENDATION

Planning staff recommends that the Board of County Commissioners transmit the proposed plan amendment. The proposed language is as follows.

GOAL 10: ~~MINERAL~~ NATURAL RESOURCE EXTRACTION. To protect areas containing identified ~~mineral~~ natural resources from incompatible urban development, while insuring that natural resource extraction operations minimize or eliminate adverse effects on surrounding land use and natural resources.

OBJECTIVE 10.1: Designate through the rezoning process sufficient lands suitable for providing fill material, ~~and limerock, and other natural resource extraction materials~~ to meet the county's needs and to export to other communities, while providing adequate protection for the county's natural resources. (Amended by Ordinance No. 94-30)

POLICY 10.1.1: ~~Mineral~~ Natural resource extraction operations intending to withdraw groundwater for any purpose must provide a monitoring system to measure groundwater impacts.

POLICY 10.1.2: Applications for ~~mineral~~ natural resource extraction permits for new or expanding areas must include an environmental assessment. The assessment will include (but not be limited to) consideration of air emissions, impact on environmental and natural resources, effect on nearby land uses, degradation of water quality, depletion of water quantity, drainage, fire and safety, noise, odor, visual impacts, transportation including access roads, sewage disposal, and solid waste disposal. (Amended by Ordinance No. 00-22)

POLICY 10.1.3: Applications for ~~mineral~~ natural resource extraction permits for new or expanding sites must include a reclamation plan which provides assurance of implementation. Reclamation plans in or near important groundwater resource areas must be designed to minimize the possibility of contamination of the groundwater during mining and after completion of the reclamation. (Amended by Ordinance No. 00-22)

POLICY 10.1.4: ~~Mineral~~ Natural resource extraction activities (and industrial uses which are ancillary to ~~mineral~~ natural resource extraction) may be permitted in areas indicated on the Future Land Use Map as Rural, Open Lands, and Density Reduction/Groundwater Resources, provided they have adequate fire protection, transportation facilities, wastewater treatment and water supply, and provided further that they have no significant adverse effects such as dust and noise on surrounding land uses and natural resources. In order to reduce transport costs and minimize wear on the county's roadways, the extraction and transport of fill material may also be permitted as an interim use in the Future Urban Areas provided that the above requirements are met; however, special restrictions may also be applied to protect other land uses. These determinations will be made during the rezoning process. (Amended by Ordinance No. 94-30, 00-22)

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OBJECTIVE 10.2: Determine and maintain a balance between the County's petroleum resources and the health, safety and welfare of the residents of its Future Urban Areas. (Added by Ordinance No. 98-09)

POLICY 10.2.1: By 2000, the county will conduct a study to determine the appropriateness of oil exploration, drilling, or production. The study will address the issues of the compatibility of oil-related activities with the environment and urban uses. This study will include recommendations regarding the appropriateness of such activities within Lee County as well as guidelines under which such activities should be regulated under the Lee County Land Development Code. (Added by Ordinance No. 98-09, Amended by Ordinance No. 00-22)

Glossary Term:

NATURAL RESOURCE EXTRACTION - The act of extracting, through various techniques, renewable and non-renewable resources in their natural state on or below the surface of the earth.

Additional Policies:

POLICY 1.1.7: The Industrial Development areas play an important role in strengthening the county's economic base and will become increasingly important as the county grows in size and urban complexity. To a great extent these are the areas to which Lee County must look for expanded job opportunities, investments and production opportunities, and a balanced and sufficient tax base. These areas have special locational requirements that are more stringent than those for residential areas, including transportation needs (e.g., air, rail, highway); industrial levels of water, sewer, fire protection, and other urban services; and locations that are convenient for employees to reach. Whereas the other Future Urban Areas will include a broad combination of residential, commercial, public, and limited industrial land uses, the Industrial Development area is to be reserved mainly for industrial activities per se, as well as for selective land use mixtures such as the combined uses of industrial, manufacturing, research, properly buffered recreational uses (except where precluded by airport hazard zone regulations), and office complexes (if specifically related to adjoining industrial uses) that constitute a growing part of Florida's economic development sector. New ~~mineral~~ natural resource extraction (mining) activities and fill dirt operations must be approved through the Industrial Planned Development rezoning process. Retail or wholesale of products manufactured or processed upon the premises may be allowed at a ratio of 1 square foot of commercial uses to 10 square feet of industrial use in association with a Planned Development. Ancillary minor retail commercial uses intended to support the surrounding industrial land uses may not exceed 30,000 square feet per development; and, at buildout, may not exceed more than ten percent (10%) of the total acreage of the lands designated as Industrial Development areas in each community outlined in Map

16. Residential uses, other than bona fide caretaker residences, are not permitted in this category except to the extent provided in Chapter XIII of the Plan. (Amended by Ordinance No. 94-30, 98-09, 99-15)

POLICY 1.4.5: The Density Reduction/Groundwater Resource (DR/GR) areas include upland areas that provide substantial recharge to aquifers most suitable for future wellfield development. These areas also are the most favorable locations for physical withdrawal of water from those aquifers. Only minimal public facilities exist or are programmed. Land uses in these areas must be compatible with maintaining surface and groundwater levels at their historic levels. Permitted land uses include agriculture, ~~mineral or limestone~~ natural resource extraction and related facilities, conservation uses, publicly-owned gun range facilities, private recreation facilities, and residential uses at a maximum density of one dwelling unit per ten acres (1 du/10 acres). Individual residential parcels may contain up to two acres of Wetlands without losing the right to have a dwelling unit, provided that no alterations are made to those wetland areas. (Amended by Ordinance 91-19, 94-30, 99-16)

POLICY 9.1.4: Protect agricultural activities on lands designated as Agricultural on the agricultural overlay from the impacts of new ~~mineral~~ natural resource extraction operations, recreational uses, and residential developments. (Amended by Ordinance No. 94-30)

PART III - LOCAL PLANNING AGENCY REVIEW AND RECOMMENDATION

DATE OF PUBLIC HEARING: February 26, 2001

A. LOCAL PLANNING AGENCY REVIEW

Staff presented this amendment before the LPA on February 26, 2001. After some discussion the LPA voted to continue the amendment. One member of the LPA asked for examples of materials that would fall under the definition. Staff noted that sand, gravel, limestone, oil, and gas are some of the most sought out resources in the county. Another member agreed there are other materials sought after and suggested staff add language to the glossary term providing examples but not limiting the term to only these materials. Another member of the LPA noted that the glossary term should not be defined with the same words used within the term (extraction) and suggested this be changed. Another member of the LPA questioned if water had been given proper consideration with the proposed changes, due to the fact that water is also a natural resource. A motion was called and carried to continue the amendment until water can be reviewed and given adequate consideration under the context of the proposed amendment.

B. REVISED STAFF ANALYSIS & RECOMMENDED LANGUAGE

Staff has evaluated the concerns of the LPA and offer the revised language provided below. In order to address the word *extraction* within the proposed glossary term staff has replaced it with the word *removing*. According to Black's Law Dictionary the word *removal* is defined as follows:

Removal - In a broad sense, the transfer of a person, thing, or case from one place to another.

In this case the word would be relating to the transfer of a thing, a natural resource, from one place to another. Staff finds that the word *removing* would be a clear and concise word to be included in the glossary term, replacing the word *extraction*.

Staff has also reviewed water under the context of the amendment. There are sufficient safeguards contained within the Lee Plan, the County's plan amendment application, and the Land Development Code in addition to South Florida Water Management District rules protecting and regulating water supply. In addition, after discussions with Lee County Natural Resource staff, it is commonly perceived that the removal of water is considered in conjunction with the term withdrawal, rather than the term extraction.

Lee Plan

The Lee Plan provides language addressing critical areas for future water supply, the protection of such critical areas, the staff appointed for reviewing proposed development near public utility wellfields, coordination with and criteria set forth by the SFWMD, identifying water pollutant sources, identifying water needs, inspections, the wellfield protection ordinance, and avoidance of premature urbanization. Following are the Goals, Objectives, and Policies from the Future Land Use, Community Facilities and Services, Conservation and Coastal Management, and Housing elements of the Lee Plan which provide the language noted above:

***POLICY 2.4.2:** All proposed changes to the Future Land Use Map in critical areas for future potable water supply (Bonita Springs as described in Policy 13.2.2; Lehigh Acres as described in Policy 34.1.9; and all land in the Density Reduction/ Groundwater Resource land use category) will be subject to a special review by the staff of Lee County. This review will analyze the proposed land uses to determine the short-term and long-term availability of irrigation and domestic water sources, and will assess whether the proposed land uses would cause any significant*

impact on present or future water resources. If the Board of County Commissioners wishes to approve any such changes to the Future Land Use Map, it must make a formal finding that no significant impacts on present or future water resources will result from the change. (Amended by Ordinance No. 92-47) (Amended by Ordinance No. 94-30, 00-22)

POLICY 2.4.3: Future Land Use Map Amendments to the existing DR/GR areas south of SR 82 east of I-75, excluding areas designated by the Port Authority as needed for airport expansion, which increase the current allowable density or intensity of land use will be discouraged by the county. It is Lee County's policy not to approve further urban designations there for the same reasons that supported its 1990 decision to establish this category. In addition to satisfying the requirements in 163 Part II Florida Statutes, Rule 9J-5 of the Florida Administrative Code, the Strategic Regional Policy Plan, the State Comprehensive Plan, and all of the criteria in the Lee Plan, applicants seeking such an amendment must:

1. analyze the proposed allowable land uses to determine the availability of irrigation and domestic water sources; and,
2. identify potential irrigation and domestic water sources, consistent with the Regional Water Supply Plan. Since regional water suppliers cannot obtain permits consistent with the planning time frame of the Lee Plan, water sources do not have to be currently permitted and available, but they must be reasonably capable of being permitted; and,
3. present data and analysis that the proposed land uses will not cause any significant harm to present and future public water resources; and,
4. supply data and analysis specifically addressing the urban sprawl criteria listed in Rule 9J-5.006(5) (g), (h), (i) and (j), FAC.

During the transmittal and adoption process, the Board of County Commissioners must review the application for all these analytical requirements and make a finding that the amendment complies with all of them. (Added by Ordinance No. 97-05)

POLICY 13.2.2: IRRIGATION WELLS. Bonita Springs (as defined in this plan) is hereby declared a critical area for future potable water supply, based on evidence that withdrawals from the main potable aquifer, the lower Tamiami aquifer, are approaching or exceeding the maximum safe yield. In response to this designation, the county will maintain current regulations to provide that new irrigation well permits in Bonita Springs may not utilize the main potable water source. (Also see Policy 34.1.9 for new permit requirements for wells in Lehigh Acres, and Policy 2.4.2 for special requirements for amendments to the Future Land Use Map.) (Amended by Ordinance No. 94-30, 00-22)

POLICY 16.4.8: If a proposed Private Recreation Facilities falls within an area identified as anticipated drawdown zone for existing or future public well development, the project must utilize an alternative water supply such as reuse or withdrawal from a different non-competing aquifer or show that adequate supply is available in excess of that being used for planned public water supply development. (Added by Ordinance No. 99-16)

POLICY 35.1.2: The Lee County Regional Water Supply Authority will plan and coordinate with all member governments in the development of comprehensive plans as they relate to wellfield protection, aquifer recharge, water supply, and related capital facilities. (Added by Ordinance No. 00-22)

POLICY 35.1.3: The Lee County Regional Water Supply Authority will perform groundwater modeling and analysis for new development, as requested by the member governments, to assess the potential impact on the water resources of member governments. The analysis will focus on the following issues:

- Adequacy of water supply, including groundwater level draw-down
 - Avoidance of adverse impacts on natural systems from water supply withdrawals.
- (Added by Ordinance No. 00-22)

e. Groundwater Recharge

GOAL 43: GROUNDWATER. *To protect the county's groundwater supplies from those activities having the potential for depleting or degrading those supplies.*

OBJECTIVE 43.1: WELLFIELD PROTECTION. *The county will maintain a wellfield protection ordinance to provide regulations protecting the quality of water flowing into potable water wellfields. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 43.1.1: *The wellfield protection ordinance will be amended whenever better technical data is developed and whenever additional potable wellfields are proposed. (Amended by Ordinance No. 00-22)*

POLICY 43.1.2: *The staff hydrogeologist will review and comment on all development applications near public utility potable water wellfields, with particular attention to proposed land uses within a 10-year travel time from the wellheads. (Amended by Ordinance No. 00-22)*

OBJECTIVE 43.2: POTABLE GROUNDWATER. *Base all future development and use of groundwater resources on determinations of the safe yield of the aquifer system(s) in order not to impair the native groundwater quality or create other environmental damage. Criteria for safe-yield determinations will be determined by the SFWMD, the agency charged with permitting these activities. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 43.2.1: *For maximum protection of groundwater resources, identify future wellfields and/or relocation site(s) for existing wellfields well in advance of need. Coordinate with SFWMD, other water suppliers, and DEP to avoid duplication and to assist in data collection and interchange. (Amended by Ordinance No. 94-30)*

POLICY 43.2.2: *Institute a program to identify sources of groundwater pollutants in Lee County and to map these (point and non-point) on a county-wide basis.*

POLICY 43.2.3: *Identify water needs consistent with projections of human population and the needs of natural systems in order to determine the future demands for groundwater. (Amended by Ordinance No. 94-30)*

POLICY 43.2.4: *Expand current programs to identify and map the contamination potential of groundwater resources for those areas of Lee County not currently under public ownership.*

POLICY 43.2.5: *Lee County, in cooperation with other agencies and the municipalities, will budget to maintain its current program of plugging non- valved, abandoned, or improperly-cased artesian wells so that at least seventy-five of these wells are plugged each year until such wells are eliminated. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 85.1.7: *Valid permits and inspection shall be required prior and subsequent to drilling operations for wells, elevator shafts, foundation holes, and test borings.*

POLICY 85.1.8: *The county shall continue its program of plugging improperly constructed wells which are detrimental to groundwater resources. (Amended by Ordinance No. 94-30)*

POLICY 100.9.7: *The county shall coordinate residential development within urban areas to coincide with existing or planned and programmed services and facilities so as to avoid premature or non-contiguous urbanization and the use of septic tanks and private wells for potable water within developed urban areas.*

Plan Amendment Application

Lee County's application for a comprehensive plan amendment requests various forms of support documentation under Part IV of the application. Section F of Part IV provides for additional requirements for specific amendments. Under this section #3 requires requests involving lands in critical areas be evaluated based on Policy 2.4.2. Part IV.F.3. is reproduced below:

3. Requests involving lands in critical areas for future water supply must be evaluated based on policy 2.4.2.

Wellfield Protection Ordinance

The wellfield protection ordinance (Ordinance No. 95-01) was adopted by the Lee County Board of County Commissioners in 1995 and is located under Article III, Section 14-201 through 14-258 of the Land Development Code. The intent of the article, under Section 14-202(b), is reproduced below:

b) The intent of this article is further to safeguard the public health, safety and welfare of the residents of the county by providing criteria for the regulation of activities which may allow the entrance of brackish water into identified protection zones surrounding existing wellfields, and prohibiting or regulating hazardous or toxic substances within identified protection zones surrounding such wellfields, thereby protecting existing public potable water supply wells from contamination. The provisions of this article apply only to the unincorporated areas of the county.

The article establishes and defines four types of wellfield protection zones and adopts protection zone maps. Under Section 14-214, titled *prohibited and regulated activities within protection zones*, earth mining within a 500-foot radius of an existing wellhead is prohibited. Also under this section of the article all protection zones, 1 through 4, are regulated that any stormwater or surface water discharge within the zones will conform to existing South Florida Water Management District and State Department of Environmental Protection rules.

Staff has reviewed and evaluated the natural resource water under the context of the proposed amendment and has determined that there is significant documentation regarding the protection and regulation of this natural resource. All of the County's regulating documents discussed above in addition to the South Florida Water Management Districts regulations, provide standards and prohibitions on the withdrawal of groundwater and the impacts of development and activities on the County's water resources. Staff has concluded that although water is a natural resource the proposed glossary term should exclude this natural resource due to the fact that it is adequately addressed through other regulations and the fact that Goal 10 and its Objectives and Policies primarily concentrate on the extraction of materials, rather than the withdrawal of groundwater.

The revised language to the Glossary term is as follows. No other changes have been made to the initial proposal. New changes to the proposed term are shown in strike through and double underlining.

Glossary Term:

NATURAL RESOURCE EXTRACTION - The act of ~~extracting removing~~, through various techniques, renewable and non-renewable resources, excluding water, in their natural state on or below the surface of the earth. Such resources include but are not limited to sand, gravel, limestone, fill dirt, oil, and natural gas.

**LOCAL PLANNING AGENCY
REVIEW AND RECOMMENDATION**

DATE OF PUBLIC HEARING: March 26, 2001

C. LOCAL PLANNING AGENCY REVIEW

**D. LOCAL PLANNING AGENCY RECOMMENDATION AND FINDINGS OF FACT
SUMMARY**

1. RECOMMENDATION:

2. BASIS AND RECOMMENDED FINDINGS OF FACT:

E. VOTE:

NOEL ANDRESS

SUSAN BROOKMAN

BARRY ERNST

RONALD INGE

GORDON REIGELMAN

VIRGINIA SPLITT

GREG STUART

**PART IV - BOARD OF COUNTY COMMISSIONERS
HEARING FOR TRANSMITTAL OF PROPOSED AMENDMENT**

DATE OF TRANSMITTAL HEARING: _____

A. BOARD REVIEW:

B. BOARD ACTION AND FINDINGS OF FACT SUMMARY:

1. BOARD ACTION:

2. BASIS AND RECOMMENDED FINDINGS OF FACT:

C. VOTE:

JOHN ALBION

ANDREW COY

BOB JANES

RAY JUDAH

DOUG ST. CERNY

DATE OF ORC REPORT: _____

- March 19, 2001
PAGE 14 OF 15

**PART VI - BOARD OF COUNTY COMMISSIONERS
HEARING FOR ADOPTION OF PROPOSED AMENDMENT**

DATE OF ADOPTION HEARING: _____

A. BOARD REVIEW:

B. BOARD ACTION AND FINDINGS OF FACT SUMMARY:

1. BOARD ACTION:

2. BASIS AND RECOMMENDED FINDINGS OF FACT:

C. VOTE:

JOHN ALBION

ANDREW COY

BOB JANES

RAY JUDAH

DOUG ST. CERNY

**CPA2000-29
BoCC SPONSORED
AMENDMENT
TO THE**

LEE COUNTY COMPREHENSIVE PLAN

THE LEE PLAN

LPA Public Hearing Document
for the
February 26th, 2001 Public Hearing

*Lee County Planning Division
1500 Monroe Street
P.O. Box 398
Fort Myers, FL 33902-0398
(941) 479-8585*

February 19, 2001

**LEE COUNTY
DIVISION OF PLANNING
STAFF REPORT FOR
COMPREHENSIVE PLAN AMENDMENT
CPA2000-29**

☒

Text Amendment

☐

Map Amendment

<input checked="" type="checkbox"/>	This Document Contains the Following Reviews:
<input checked="" type="checkbox"/>	Staff Review
<input type="checkbox"/>	Local Planning Agency Review and Recommendation
<input type="checkbox"/>	Board of County Commissioners Hearing for Transmittal
<input type="checkbox"/>	Staff Response to the DCA Objections, Recommendations, and Comments (ORC) Report
<input type="checkbox"/>	Board of County Commissioners Hearing for Adoption

STAFF REPORT PREPARATION DATE: February 19, 2001

PART I - BACKGROUND AND STAFF RECOMMENDATION

A. SUMMARY OF APPLICATION

1. APPLICANT:

LEE COUNTY BOARD OF COUNTY COMMISSIONERS
REPRESENTED BY LEE COUNTY DIVISION OF PLANNING

2. REQUEST:

Evaluate adding a definition for the term "Natural Resource Extraction" to the Lee Plan Glossary. In addition, amend the Future Land Use Element by adding the term "Natural Resource Extraction" to Goal 10 and its Objectives and Policies, where applicable, clarifying that natural resources other than minerals are subject to Goal 10 requirements.

B. STAFF RECOMMENDATION AND FINDINGS OF FACT SUMMARY:

1. RECOMMENDATION: Planning staff recommends that the Board of County Commissioners transmit the proposed amendment as provided under Part C, the Staff Recommendation portion of this report.

2. BASIS AND RECOMMENDED FINDINGS OF FACT:

- A broader term for mineral extraction is needed to clarify that natural resources other than minerals are subject to Goal 10 requirements.
- Principal resources sought in Lee County are sand, gravel, limestone, oil and gas which include both organic and inorganic materials.
- It should be ensured that all mined materials, organic and inorganic, are included under the language of Goal 10.
- The improved term, "Natural Resource Extraction," should be placed in the Lee Plan Glossary to support the new term.

C. BACKGROUND INFORMATION

This amendment was initiated by the Board of County Commissioners on September 19, 2000. The amendment stems from a suggested improvement to the Lee Plan by an LPA member. This issue was brought up during a public hearing in which the upcoming amendment cycle was being discussed and suggestions taken. The proposal was for staff to evaluate Goal 10, Mineral Extraction, and its references to limerock. This member of the LPA noted that technically limerock is not a mineral, but is an organic material and suggested adding improved language such as a definition for natural resource extraction.

PART II - STAFF ANALYSIS

A. STAFF DISCUSSION

Goal 10 and its Objective and Policies address the extractive industry in Lee County and provides for the protection of natural resources, such as mineral resources, while limiting the potential adverse effects associated with the extraction of such resources. Goal 10, Objective 10.1, and the policies that follow are reproduced below:

GOAL 10: MINERAL EXTRACTION. *To protect areas containing identified mineral resources from incompatible urban development, while insuring that extraction operations minimize or eliminate adverse effects on surrounding land use and natural resources.*

OBJECTIVE 10.1: *Designate through the rezoning process sufficient lands suitable for providing fill material and limerock to meet the county's needs and to export to other communities, while providing adequate protection for the county's natural resources. (Amended by Ordinance No. 94-30)*

POLICY 10.1.1: *Mineral extraction operations intending to withdraw groundwater for any purpose must provide a monitoring system to measure groundwater impacts.*

POLICY 10.1.2: *Applications for mineral extraction permits for new or expanding areas must include an environmental assessment. The assessment will include (but not be limited to) consideration of air emissions, impact on environmental and natural resources, effect on nearby land uses, degradation of water quality, depletion of water quantity, drainage, fire and safety, noise, odor, visual impacts, transportation including access roads, sewage disposal, and solid waste disposal. (Amended by Ordinance No. 00-22)*

POLICY 10.1.3: *Applications for mineral extraction permits for new or expanding sites must include a reclamation plan which provides assurance of implementation. Reclamation plans in or near important groundwater resource areas must be designed to minimize the possibility of contamination of the groundwater during mining and after completion of the reclamation. (Amended by Ordinance No. 00-22)*

POLICY 10.1.4: *Mineral extraction activities (and industrial uses which are ancillary to mineral extraction) may be permitted in areas indicated on the Future Land Use Map as Rural, Open Lands, and Density Reduction/Groundwater Resources, provided they have adequate fire protection, transportation facilities, wastewater treatment and water supply, and provided further that they have no significant adverse effects such as dust and noise on surrounding land uses and natural resources. In order to reduce transport costs and minimize wear on the county's roadways, the extraction and transport of fill material may also be permitted as an interim use in the Future Urban Areas provided that the above requirements are met; however, special restrictions may also be applied to protect other land uses. These determinations will be made during the rezoning process. (Amended by Ordinance No. 94-30, 00-22)*

POLICY 10.1.5: *Lee County will support efforts by government, community leaders, and the rock mining industry owners and businesses to seek incentives that will help to facilitate the connection of rock mining borrow lake excavations into a system of interconnected lakes and flowways that will enhance wildlife habitat values, provide for human recreation, educational and other appropriate uses, and/or strengthen community environmental benefits. (Added by Ordinance No. 99-15)*

The Goal provides specific language for the protection of mineral resources, the protection of surrounding land uses, reclamation, the prevention of the degradation of environmental resources and existing infrastructure, and provides language on the enhancement of the environment as an end result of extraction activities. The principal resources sought in Lee County, pertaining to the extraction industry, are sand, gravel, limestone, oil, and gas. These resources include both organic and inorganic materials according to the following two definitions of "mineral" and "limestone" taken from the Dictionary of Natural Resource Management (1996):

MINERAL *A non-technical word more specifically defined by legislation, usually involving one or more of the following: (1) a scientifically recognized inorganic material; (2) a material classified commercially as a mineral; (3) a material derived from the earth that possesses economic value and utility aside from the agricultural purposes of the land surface itself.*

Minerals include sand, gravel (common minerals), precious or semi-precious stones, coal, petroleum resources, and natural gas, even though the latter three are not inorganic. Some definitions limit the term to inorganic materials having a distinct chemical composition, characteristic crystalline structure, colour, and hardness.

LIMESTONE *A sedimentary rock consisting mainly (greater than 50 per cent) of calcium carbonate, typically as calcite. Limestone is formed by a combination of organic and inorganic processes and includes chemical and clastic (soluble and insoluble) constituents. Many forms of limestone contain fossils.*

Staff has evaluated Goal 10 and its Objectives and Policies, where applicable, and concur that a broader term for mineral extraction is needed to clarify that natural resources other than minerals are subject to Goal 10 requirements. Staff has evaluated the term *natural resource extraction* and also concurs that this would be the best term to ensure the inclusion of all materials, organic and inorganic, sought by the extractive industry. Throughout the language under Goal 10, mineral extraction, limerock, and rock mining are referenced.

Mining and fill dirt operations are required elements in a well balanced economy. Such operations provide fill allowing development to occur and provide raw materials for many other products. The proposed amendment will correct and bring all of the resources intended to be regulated under the Goal under unified terminology. Staff is proposing to add a definition of *natural resource extraction* to the Lee Plan Glossary.

In addition to the broader term and Glossary definition, staff is recommending that the term rock mining industry in Policy 10.1.5 be replaced with the term extractive industry. This will allow the language of the policy to include all types of mining. Staff is also recommending that Policy 1.1.7, Policy 1.4.5, and Policy 9.1.4 of the Future Land Use Element, which include references to mineral extraction, be amended to include the proposed term *natural resource extraction*.

B. CONCLUSIONS

Goal 10 and its Objectives and Policies give specific language in regards to extraction requirements yet refers only to mineral extraction. In light of the fact that limerock is a major resource found within the County but would not technically fall under the term "mineral" due to its organic properties, staff is proposing that the term *natural resource extraction* be adopted to replace the references to mineral extraction. Staff also proposes a definition in the Lee Plan Glossary to support the new term and also proposes the replacement of references to mineral extraction in Policy 1.1.7, Policy 1.4.5, and Policy 9.1.4 of the Future Land Use Element.

C. STAFF RECOMMENDATION

Planning staff recommends that the Board of County Commissioners transmit the proposed plan amendment. The proposed language is as follows.

GOAL 10: ~~MINERAL~~ NATURAL RESOURCE EXTRACTION. To protect areas containing identified ~~mineral~~ natural resources from incompatible urban development, while insuring that natural resource extraction operations minimize or eliminate adverse effects on surrounding land use and natural resources.

OBJECTIVE 10.1: Designate through the rezoning process sufficient lands suitable for providing fill material, ~~and limerock, and other natural resource extraction materials~~ to meet the county's needs and to export to other communities, while providing adequate protection for the county's natural resources. (Amended by Ordinance No. 94-30)

POLICY 10.1.1: ~~Mineral~~ Natural resource extraction operations intending to withdraw groundwater for any purpose must provide a monitoring system to measure groundwater impacts.

POLICY 10.1.2: Applications for ~~mineral~~ natural resource extraction permits for new or expanding areas must include an environmental assessment. The assessment will include (but not be limited to) consideration of air emissions, impact on environmental and natural resources, effect on nearby land uses, degradation of water quality, depletion of water quantity, drainage, fire and safety, noise, odor, visual impacts, transportation including access roads, sewage disposal, and solid waste disposal. (Amended by Ordinance No. 00-22)

POLICY 10.1.3: Applications for ~~mineral~~ natural resource extraction permits for new or expanding sites must include a reclamation plan which provides assurance of implementation. Reclamation plans in or near important groundwater resource areas must be designed to minimize the possibility of contamination of the groundwater during mining and after completion of the reclamation. (Amended by Ordinance No. 00-22)

POLICY 10.1.4: ~~Mineral~~ Natural resource extraction activities (and industrial uses which are ancillary to ~~mineral~~ natural resource extraction) may be permitted in areas indicated on the Future Land Use Map as Rural, Open Lands, and Density Reduction/Groundwater Resources, provided they have adequate fire protection, transportation facilities, wastewater treatment and water supply, and provided further that they have no significant adverse effects such as dust and noise on surrounding land uses and natural resources. In order to reduce transport costs and minimize wear on the county's roadways, the extraction and transport of fill material may also be permitted as an interim use in the Future Urban Areas provided that the above requirements are met; however, special restrictions may also be applied to protect other land uses. These determinations will be made during the rezoning process. (Amended by Ordinance No. 94-30, 00-22)

POLICY 10.1.5: Lee County will support efforts by government, community leaders, and the ~~rock mining~~ extractive industry owners and businesses to seek incentives that will help to facilitate the connection of ~~rock mining~~ natural resource extraction borrow lake excavations into a system of interconnected lakes and flowways that will enhance wildlife habitat values, provide for human recreation, educational and other appropriate uses, and/or strengthen community environmental benefits. (Added by Ordinance No. 99-15)

OBJECTIVE 10.2: Determine and maintain a balance between the County's petroleum resources and the health, safety and welfare of the residents of its Future Urban Areas. (Added by Ordinance No. 98-09)

POLICY 10.2.1: By 2000, the county will conduct a study to determine the appropriateness of oil exploration, drilling, or production. The study will address the issues of the compatibility of oil-related activities with the environment and urban uses. This study will include recommendations regarding the appropriateness of such activities within Lee County as well as guidelines under which such activities should be regulated under the Lee County Land Development Code. (Added by Ordinance No. 98-09, Amended by Ordinance No. 00-22)

Glossary Term:

NATURAL RESOURCE EXTRACTION - The act of extracting, through various techniques, renewable and non-renewable resources in their natural state on or below the surface of the earth.

Additional Policies:

POLICY 1.1.7: The Industrial Development areas play an important role in strengthening the county's economic base and will become increasingly important as the county grows in size and urban complexity. To a great extent these are the areas to which Lee County must look for expanded job opportunities, investments and production opportunities, and a balanced and sufficient tax base. These areas have special locational requirements that are more stringent than those for residential areas, including transportation needs (e.g., air, rail, highway); industrial levels of water, sewer, fire protection, and other urban services; and locations that are convenient for employees to reach. Whereas the other Future Urban Areas will include a broad combination of residential, commercial, public, and limited industrial land uses, the Industrial Development area is to be reserved mainly for industrial activities per se, as well as for selective land use mixtures such as the combined uses of industrial, manufacturing, research, properly buffered recreational uses (except where precluded by airport hazard zone regulations), and office complexes (if specifically related to adjoining industrial uses) that constitute a growing part of Florida's economic development sector. New ~~mineral~~ natural resource extraction (mining) activities and fill dirt operations must be approved through the Industrial Planned Development rezoning process. Retail or wholesale of products manufactured or processed upon the premises may be allowed at a ratio of 1 square foot of commercial uses to 10 square feet of industrial use in association with a Planned Development. Ancillary minor retail commercial uses intended to support the surrounding industrial land uses may not exceed 30,000 square feet per development; and, at buildout, may not exceed more than ten percent (10%) of the total acreage of the lands designated as Industrial Development areas in each community outlined in Map

16. Residential uses, other than bona fide caretaker residences, are not permitted in this category except to the extent provided in Chapter XIII of the Plan. (Amended by Ordinance No. 94-30, 98-09, 99-15)

POLICY 1.4.5: The Density Reduction/Groundwater Resource (DR/GR) areas include upland areas that provide substantial recharge to aquifers most suitable for future wellfield development. These areas also are the most favorable locations for physical withdrawal of water from those aquifers. Only minimal public facilities exist or are programmed. Land uses in these areas must be compatible with maintaining surface and groundwater levels at their historic levels. Permitted land uses include agriculture, ~~mineral or limestone~~ natural resource extraction and related facilities, conservation uses, publicly-owned gun range facilities, private recreation facilities, and residential uses at a maximum density of one dwelling unit per ten acres (1 du/10 acres). Individual residential parcels may contain up to two acres of Wetlands without losing the right to have a dwelling unit, provided that no alterations are made to those wetland areas. (Amended by Ordinance 91-19, 94-30, 99-16)

POLICY 9.1.4: Protect agricultural activities on lands designated as Agricultural on the agricultural overlay from the impacts of new ~~mineral~~ natural resource extraction operations, recreational uses, and residential developments. (Amended by Ordinance No. 94-30)

**PART III - LOCAL PLANNING AGENCY
REVIEW AND RECOMMENDATION**

DATE OF PUBLIC HEARING: February 26, 2001

A. LOCAL PLANNING AGENCY REVIEW

B. LOCAL PLANNING AGENCY RECOMMENDATION AND FINDINGS OF FACT SUMMARY

1. RECOMMENDATION:

2. BASIS AND RECOMMENDED FINDINGS OF FACT:

C. VOTE:

NOEL ANDRESS

SUSAN BROOKMAN

BARRY ERNST

RONALD INGE

GORDON REIGELMAN

VIRGINIA SPLITT

GREG STUART

**PART IV - BOARD OF COUNTY COMMISSIONERS
HEARING FOR TRANSMITTAL OF PROPOSED AMENDMENT**

DATE OF TRANSMITTAL HEARING: _____

A. BOARD REVIEW:

B. BOARD ACTION AND FINDINGS OF FACT SUMMARY:

1. BOARD ACTION:

2. BASIS AND RECOMMENDED FINDINGS OF FACT:

C. VOTE:

JOHN ALBION

ANDREW COY

BOB JANES

RAY JUDAH

DOUG ST. CERNY

**PART V - DEPARTMENT OF COMMUNITY AFFAIRS OBJECTIONS, RECOMMENDATIONS,
AND COMMENTS (ORC) REPORT**

DATE OF ORC REPORT: _____

A. DCA OBJECTIONS, RECOMMENDATIONS AND COMMENTS

B. STAFF RESPONSE

**PART VI - BOARD OF COUNTY COMMISSIONERS
HEARING FOR ADOPTION OF PROPOSED AMENDMENT**

DATE OF ADOPTION HEARING: _____

A. BOARD REVIEW:

B. BOARD ACTION AND FINDINGS OF FACT SUMMARY:

1. BOARD ACTION:

2. BASIS AND RECOMMENDED FINDINGS OF FACT:

C. VOTE:

JOHN ALBION

ANDREW COY

BOB JANES

RAY JUDAH

DOUG ST. CERNY



Lee County Board of County Commissioners
Department of Community Development
Division of Planning
Post Office Box 398
Fort Myers, FL 33902-0398
Telephone: (941) 479-8585
FAX: (941) 479-8519

APPLICATION FOR A COMPREHENSIVE PLAN AMENDMENT

(To be completed at time of intake)

DATE REC'D: _____ REC'D BY: _____

APPLICATION FEE: _____ TIDEMARK NO: _____

THE FOLLOWING VERIFIED:

Zoning ☐ Commissioner District ☐

Designation on FLUM ☐

(To be completed by Planning Staff)

Plan Amendment Cycle: ☐ Normal ☐ Small Scale ☐ DRI ☐ Emergency

Request No: _____

APPLICANT PLEASE NOTE:

Answer all questions completely and accurately. Please print or type responses. If additional space is needed, number and attach additional sheets. The total number of sheets in your application is: _____

Submit **6** copies of the complete application and amendment support documentation, including maps, to the Lee County Division of Planning. Additional copies may be required for Local Planning Agency, Board of County Commissioners hearings and the Department of Community Affairs' packages.

I, the undersigned owner or authorized representative, hereby submit this application and the attached amendment support documentation. The information and documents provided are complete and accurate to the best of my knowledge.

DATE _____ SIGNATURE OF OWNER OR AUTHORIZED REPRESENTATIVE _____

I. APPLICANT/AGENT/OWNER INFORMATION

APPLICANT

ADDRESS

CITY STATE ZIP

TELEPHONE NUMBER FAX NUMBER

AGENT*

ADDRESS

CITY STATE ZIP

TELEPHONE NUMBER FAX NUMBER

OWNER(s) OF RECORD

ADDRESS

CITY STATE ZIP

TELEPHONE NUMBER FAX NUMBER

Name, address and qualification of additional planners, architects, engineers, environmental consultants, and other professionals providing information contained in this application.

* This will be the person contacted for all business relative to the application.

II. REQUESTED CHANGE (Please see Item 1 for Fee Schedule)

A. TYPE: (Check appropriate type)

☐ Text Amendment

☐ Future Land Use Map Series Amendment
(Maps 1 thru 19)
List Number(s) of Map(s) to be amended

B. SUMMARY OF REQUEST (Brief explanation):

**III. PROPERTY SIZE AND LOCATION OF AFFECTED PROPERTY
(for amendments affecting development potential of property)**

A. Property Location:

1. Site Address:_____

2. STRAP(s):_____

B. Property Information

Total Acreage of Property:_____

Total Acreage included in Request:_____

Area of each Existing Future Land Use Category:_____

Total Uplands:_____

Total Wetlands:_____

Current Zoning:_____

Current Future Land Use Designation:_____

Existing Land Use: _____

- C. State if the subject property is located in one of the following areas and if so how does the proposed change effect the area:

Lehigh Acres Commercial Overlay: _____

Airport Noise Zone 2 or 3: _____

Acquisition Area: _____

Joint Planning Agreement Area (adjoining other jurisdictional lands): _____

Community Redevelopment Area: _____

- D. Proposed change for the Subject Property:

- E. Potential development of the subject property:

1. Calculation of maximum allowable development under existing FLUM:

Residential Units/Density _____

Commercial intensity _____

Industrial intensity _____

2. Calculation of maximum allowable development under proposed FLUM:

Residential Units/Density _____

Commercial intensity _____

Industrial intensity _____

IV. AMENDMENT SUPPORT DOCUMENTATION

At a minimum, the application shall include the following support data and analysis. These items are based on comprehensive plan amendment submittal requirements of the State of Florida, Department of Community Affairs, and policies contained in the Lee County Comprehensive Plan. Support documentation provided by the applicant will be used by staff as a basis for evaluating this request. To assist in the preparation of amendment packets, the applicant is encouraged to provide all data and analysis electronically. (Please contact the Division of Planning for currently accepted formats)

A. General Information and Maps

NOTE: For each map submitted, the applicant will be required to provide a reduced map (8.5" x 11") for inclusion in public hearing packets.

The following pertains to all proposed amendments that will affect the development potential of properties (unless otherwise specified).

1. Provide any proposed text changes.
2. Provide a Future Land Use Map showing the boundaries of the subject property, surrounding street network, surrounding designated future land uses, and natural resources.
3. Map and describe existing land *uses* (not designations) of the subject property and surrounding properties. Description should discuss consistency of current uses with the proposed changes.
4. Map and describe existing zoning of the subject property and surrounding properties.
5. The legal description(s) for the property subject to the requested change.
6. A copy of the deed(s) for the property subject to the requested change.
7. An aerial map showing the subject property and surrounding properties.
8. If applicant is not the owner, a letter from the owner of the property authorizing the applicant to represent the owner.

B. Public Facilities Impacts

NOTE: The applicant must calculate public facilities impacts based on a maximum development scenario (see Part II.H.).

1. Traffic Circulation Analysis

The analysis is intended to determine the effect of the land use change on the Financially Feasible Transportation Plan/Map 3A (20-year horizon) and on the Capital Improvements Element (5-year horizon). Toward that end, an applicant must submit the following information:

Long Range – 20-year Horizon:

- a. Working with Planning Division staff, identify the traffic analysis zone (TAZ) or zones that the subject property is in and the socio-economic data forecasts for that zone or zones;

- b. Determine whether the requested change requires a modification to the socio-economic data forecasts for the host zone or zones. The land uses for the proposed change should be expressed in the same format as the socio-economic forecasts (number of units by type/number of employees by type/etc.);
- c. If no modification of the forecasts is required, then no further analysis for the long range horizon is necessary. If modification is required, make the change and provide to Planning Division staff, for forwarding to DOT staff. DOT staff will rerun the FSUTMS model on the current adopted Financially Feasible Plan network and determine whether network modifications are necessary, based on a review of projected roadway conditions within a 3-mile radius of the site;
- d. If no modifications to the network are required, then no further analysis for the long range horizon is necessary. If modifications are necessary, DOT staff will determine the scope and cost of those modifications and the effect on the financial feasibility of the plan;
- e. An inability to accommodate the necessary modifications within the financially feasible limits of the plan will be a basis for denial of the requested land use change;
- f. If the proposal is based on a specific development plan, then the site plan should indicate how facilities from the current adopted Financially Feasible Plan and/or the Official Trafficways Map will be accommodated.

Short Range – 5-year CIP horizon:

- a. Besides the 20-year analysis, for those plan amendment proposals that include a specific and immediated development plan, identify the existing roadways serving the site and within a 3-mile radius (indicate laneage, functional classification, current LOS, and LOS standard);
 - b. Identify the major road improvements within the 3-mile study area funded through the construction phase in adopted CIP's (County or Cities) and the State's adopted Five-Year Work Program;
- Projected 2020 LOS under proposed designation (calculate anticipated number of trips and distribution on roadway network, and identify resulting changes to the projected LOS);
- c. For the five-year horizon, identify the projected roadway conditions (volumes and levels of service) on the roads within the 3-mile study area with the programmed improvements in place, with and without the proposed development project. A methodology meeting with DOT staff prior to submittal is required to reach agreement on the projection methodology;
 - d. Identify the additional improvements needed on the network beyond those programmed in the five-year horizon due to the development proposal.

2. Provide an existing and future conditions analysis for:
 - a. Sanitary Sewer
 - b. Potable Water
 - c. Surface Water/Drainage Basins
 - d. Parks, Recreation, and Open Space.

Analysis should include (but is not limited to) the following:

- Franchise Area, Basin, or District in which the property is located;
- Current LOS, and LOS standard of facilities serving the site;
- Projected 2020 LOS under existing designation;
- Projected 2020 LOS under proposed designation;
- Improvements/expansions currently programmed in 5 year CIP, 6-10 year CIP, and long range improvements; and
- Anticipated revisions to the Community Facilities and Services Element and/or Capital Improvements Element (state if these revisions are included in this amendment).

3. Provide a letter from the appropriate agency determining the adequacy/provision of existing/proposed support facilities, including:
 - a. Fire protection with adequate response times;
 - b. Emergency medical service (EMS) provisions;
 - c. Law enforcement;
 - c. Solid Waste;
 - d. Mass Transit; and
 - e. Schools.

In reference to above, the applicant should supply the responding agency with the information from Section's II and III for their evaluation. This application should include the applicant's correspondence to the responding agency.

C. Environmental Impacts

Provide an overall analysis of the character of the subject property and surrounding properties, and assess the site's suitability for the proposed use upon the following:

1. A map of the Plant Communities as defined by the Florida Land Use Cover and Classification system (FLUCCS).
2. A map and description of the soils found on the property (identify the source of the information).
3. A topographic map with property boundaries and 100-year flood prone areas

indicated (as identified by FEMA).

4. A map delineating wetlands, aquifer recharge areas, and rare & unique uplands.
5. A table of plant communities by FLUCCS with the potential to contain species (plant and animal) listed by federal, state or local agencies as endangered, threatened or species of special concern. The table must include the listed species by FLUCCS and the species status (same as FLUCCS map).

D. Impacts on Historic Resources

List all historic resources (including structure, districts, and/or archeologically sensitive areas) and provide an analysis of the proposed change's impact on these resources. The following should be included with the analysis:

1. A map of any historic districts and/or sites, listed on the Florida Master Site File, which are located on the subject property or adjacent properties.
2. A map showing the subject property location on the archeological sensitivity map for Lee County.

E. Internal Consistency with the Lee Plan

1. Discuss how the proposal affects established Lee County population projections, Table 1(b) (Planning Community Year 2020 Allocations), and the total population capacity of the Lee Plan Future Land Use Map.
2. List all goals and objectives of the Lee Plan that are affected by the proposed amendment. This analysis should include an evaluation of all relevant policies under each goal and objective.
3. Describe how the proposal affects adjacent local governments and their comprehensive plans.
4. List State Policy Plan and Regional Policy Plan goals and policies which are relevant to this plan amendment.

F. Additional Requirements for Specific Future Land Use Amendments

1. Requests involving Industrial and/or categories targeted by the Lee Plan as employment centers (to or from)
 - a. State whether the site is accessible to arterial roadways, rail lines, and cargo airport terminals,
 - b. Provide data and analysis required by Policy 2.4.4,

- c. The affect of the proposed change on county's industrial employment goal specifically policy 7.1.4.
2. Requests moving lands from a Non-Urban Area to a Future Urban Area
 - a. Demonstrate why the proposed change does not constitute Urban Sprawl. Indicators of sprawl may include, but are not limited to: low-intensity, low-density, or single-use development; 'leap-frog' type development; radial, strip, isolated or ribbon pattern type development; a failure to protect or conserve natural resources or agricultural land; limited accessibility; the loss of large amounts of functional open space; and the installation of costly and duplicative infrastructure when opportunities for infill and redevelopment exist.
 3. Requests involving lands in critical areas for future water supply must be evaluated based on policy 2.4.2.
 4. Requests moving lands from Density Reduction/Groundwater Resource must fully address Policy 2.4.3 of the Lee Plan Future Land Use Element.
- G. Justify the proposed amendment based upon sound planning principles. Be sure to support all conclusions made in this justification with adequate data and analysis.

Item 1: Fee Schedule

Map Amendment Flat Fee	\$500.00 each
Map Amendment > 20 Acres	\$500.00 and \$20.00 per 10 acres up to a maximum of \$2,255.00
Text Amendment Flat Fee	\$1,250.00 each

AFFIDAVIT

I, _____, certify that I am the owner or authorized representative of the property described herein, and that all answers to the questions in this application and any sketches, data, or other supplementary matter attached to and made a part of this application, are honest and true to the best of my knowledge and belief. I also authorize the staff of Lee County Community Development to enter upon the property during normal working hours for the purpose of investigating and evaluating the request made through this application.

Signature of owner or owner-authorized agent

Date

Typed or printed name

STATE OF FLORIDA)
COUNTY OF LEE)

The foregoing instrument was certified and subscribed before me this _____ day of _____ 19____,
by _____, who is personally known to me or who has produced
_____ as identification.

(SEAL)

Signature of notary public

Printed name of notary public

LAND DEVELOPMENT CODE

LEE COUNTY, FLORIDA

Republished by Order of the Board of County Commissioners

Adopted: April 20, 1994



MUNICIPAL CODE CORPORATION

Tallahassee, Florida

2000

REPUBLICATION
September 2000

LAND DEVELOPMENT CODE

LEE COUNTY, FLORIDA

Looseleaf Supplement

This copy of the Lee County Land Development Code is issued as a "replacement" copy and contains all ordinances deemed advisable to be included at this time through Ordinance No. 00-07, adopted April 25, 2000. See the Code Comparative Table.

This copy replaces all existing copies of the Code, as published through October 4, 1999. Future Supplements will commence with Supp. No. 1.

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subsequent delegation of the appropriate legislative body or administrative agency having such jurisdiction.

(Ord. No. 89-39, § 4, 9-20-89)

Sec. 14-158. Designation of regulated area.

The general regulated area encompassed by this division shall extend from the downriver or southwest boundary of the waters described in section 14-157 to the northeasterly right-of-way line of the Edison Bridge. Within those boundaries and with the exception of the special management zones outlined in section 14-159, all navigable waters, creeks, bayous, canals and channels which feed the Caloosahatchee River and all waters from the shoreline of the river to a line running parallel to the shoreline of the Caloosahatchee River and situated one-quarter mile from the shoreline are designated a slow speed zone. Unless otherwise indicated in this division or superseded by state or federal statute, the marked Okeechobee Waterway channel is excluded from the slow speed restrictions. While in the Okeechobee Waterway Channel, persons shall operate their vessels at a safe speed and in a careful and prudent manner.

(Ord. No. 89-39, § 6, 9-20-89)

Sec. 14-159. Designation of special management areas.

Within the area described in section 14-157 there are six special management areas. In special management areas, boat speeds are regulated by this division and state rule. Within the Okeechobee Waterway channel, boat speeds are regulated by state rule.

- (1) Special management area 1 consists of the area from the northeast right-of-way of the Edison Bridge upriver to the railroad trestle. With the exception of the marked Okeechobee Waterway channel and the area which falls within the boundaries of special management area 6, this area is designated a yearround slow speed zone.
- (2) Special management area 2 consists of the area from a line drawn 100 yards downstream of and parallel to the Caloosahatchee River/U.S. 41 Bridge upriver to a line drawn perpendicular to the shoreline and 500 yards upriver of Red Day marker 40A. With the exception of the marked waterway channel, this area is designated a yearround slow speed zone.
- (3) Special management area 3 consists of the area from a line drawn from Shell Creek to Green Day marker 99 upriver to a second line drawn from Shell Point to Little Shell Island. This area, including the Okeechobee Waterway to the extent such waterway may be made subject to the provisions of this division by a grant of authority from the legislative body or agency having jurisdiction over such waterway, is designated a yearround slow speed zone between the hours of 8:00 a.m. to 6:00 p.m. daily.
- (4) Special management area 4 consists of the area from a line drawn perpendicular to the shoreline and one-half mile downstream of the Franklin Locks to a second line drawn perpendicular to the shoreline and one-eighth mile upstream of the Franklin Locks. This area shall include the lock chambers, boatramps and basins, and the surrounding areas. This area, including the Okeechobee Waterway to the extent that such waterway may be made subject to this division by a grant of authority to the county by the appropriate legislative body or agency having jurisdiction over the waterway, is designated a yearround slow speed zone.
- (5) Special management area 5 consists of the area from a line drawn parallel to and 300 feet downstream of the Cape Coral Bridge to a line drawn parallel and 300 feet upstream of the Cape Coral Bridge, with the exception of the marked Okeechobee Waterway channel. This area is designated a yearround slow speed zone.
- (6) Special management area 6 consists of the area from the northeast right-of-way line of the Edison Bridge to a line located one mile upstream of the northeast right-

of-way line and drawn perpendicular to the shoreline. This area will further be bounded by the north shoreline of the river and the southerly line of the marked Okeechobee Waterway channel. This area is designated as a yearround boating recreation area where water sports such as water skiing and jet skiing are encouraged. Boat speeds that are appropriate for these activities will be permitted.

(Ord. No. 89-39, § 7, 9-20-89)

Sec. 14-160. Additional areas of special management.

No owner, operator or person in command of any vessel shall permit or operate a vessel at a speed greater than or in excess of either idle speed or slow speed, or under motor power, whichever is applicable, whenever the vessel is in an area of special management, except as to prohibited areas or regulated areas. These areas are so designated to provide increased protection of the manatees and other natural resources. The following areas are hereby designated as areas of special management:

- (1) Any area designated as an official "No Wake—Idle Speed Only" zone or "Slow Speed" zone which is so posted in such a manner and place that such posting may be reasonably expected to be seen and read by a person in operation of a vessel in the area. Such areas are identified on exhibit A attached to the ordinance from which this section is derived, which is on file in the office of the county department of public resources;
- (2) Any area designated as an official "No Motor Power" zone which is so posted in such a manner and place that such posting may be reasonably expected to be seen and read by a person in operation of a vessel in the area. Operation of a vessel in these areas shall be without motor power. Poling, rowing or wind power is permissible. Such areas are identified on exhibit B attached to the ordinance from which this section is derived, which is on file in the office of the county department of public resources; or

- (3) Any other area that may be so designated by the Board of County Commissioners pursuant to the applicable procedure.

(Ord. No. 90-51, § 6, 9-19-90; Ord. No. 90-63, §§ 4, 5, 12-19-90)

Secs. 14-161—14-200. Reserved.

ARTICLE III. WELLFIELD PROTECTION

DIVISION 1. GENERALLY

Sec. 14-201. Statutory authority; scope of article.

(a) Pursuant to the authority granted by F.S. ch. 125 and F.S. § 163.3202(2)(c), the standards, rules and regulations set forth in this article have been promulgated and approved by the Board of County Commissioners and apply to all abandoned wells and to certain public utility potable water supply wellfields in the unincorporated area of the county.

(b) The regulations set forth in this article apply to all areas surrounding a wellfield and designated as wellfield protection zones on the adopted protection zone map.

(Ord. No. 89-30, § 1(1.02), (4.01), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-202. Intent of article.

(a) In order to properly protect certain existing potable water supply wellfields in the unincorporated area of the county, the Board of County Commissioners declares that the storage, handling, use or production of hazardous or toxic substances and the location of abandoned wells in close proximity to public utility potable water supply wells is potentially harmful to the drinking water of the county, and that abandoned wells and certain land uses and activities involving hazardous or toxic substances are hereby prohibited or regulated within certain defined protection zones around public utility potable water supply wellfields in the unincorporated area of the county.

haz + toxic materials + location of abandoned wells harmful to drinking water
Abandoned wells + certain land uses are prohibited within certain zones

(b) The intent of this article is further to safeguard the public health, safety and welfare of the residents of the county by providing criteria for the regulation of activities which may allow the entrance of brackish water into identified protection zones surrounding existing wellfields, and prohibiting or regulating hazardous or toxic substances within identified protection zones surrounding such wellfields, thereby protecting existing public potable water supply wells from contamination. The provisions of this article apply only to the unincorporated areas of the county. (Ord. No. 89-30, § 1(1.03), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-203. Definitions.

The following words, terms and phrases, when used in this article, have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

Abandoned well means a well that does not have a properly functioning valve, the use of which has been permanently discontinued, that does not meet current well construction standards, that is discharging water containing greater than 500 milligrams per liter of chlorides into a drinking water aquifer, that is in such a state of disrepair that it cannot be used for its intended purpose without having an adverse impact upon an aquifer which serves as a source of drinking water or which is likely to be such a source in the future, or that does not have proper flow control on or below the land surface (see F.S. § 373.203(1)).

Aquifer means an underground water-bearing geologic formation sufficiently permeable to yield quantities of water to wells and springs (see rule 17-21.020(12), Florida Administrative Code).

Brackish water means water with total dissolved solids greater than 1,000 parts per million.

Capillarity and *capillary action* mean the action by which a fluid, such as water, is drawn up (or depressed) in small interstices or tubes as a result of surface tension.

Closure means the termination of any regulated or prohibited nonresidential land use or activity covered by this article.

Contaminant means any physical, chemical, biological or radiological substance or matter in the water (see F.S. § 403.852(9)).

Contamination means the presence of any harmful or deleterious substances in the water supply.

Continuous transit means the nonstop movement of a mobile vehicle except for stops required by traffic laws.

DEP means Florida Department of Environmental Protection or successor agency.

Division means the division of natural resources management of the county, and any succeeding agency authorized to perform similar functions or duties.

Dry retention means a stormwater storage area with a bottom elevation at least one foot above the control elevation of the area.

EP (extraction procedure) toxic material means a substance determined to be toxic as defined under the EPA Resource Conservation and Recovery Act criteria (40 CFR 261.24).

EPA means the United States Environmental Protection Agency.

Groundwater means water below the land surface in a zone wherein all of the interstices are filled with water (see 17-28.120(33), Florida Administrative Code).

Hazardous substance means a substance that has one or more of the following characteristics: ignitability, corrosivity, reactivity, EP toxicity or toxicity.

Iso-travel time contour means the locus of points from which groundwater takes an equal amount of time to reach a given destination such as a well or wellfield.

Liquid waste means sludge, septic or other liquid waste from wastewater treatment plants, septic tanks, grease traps or sediment traps.

Monitor well means a well used primarily to monitor hydrologic parameters such as water levels or water quality (see rule 40E-3.021, Florida Administrative Code).

Nonresidential land use or activity means any land use or activity regulated by this article which occurs in any building, structure or open area which is not used primarily as a private residence or dwelling. Any land use or activity which produces, stores, uses or handles more than 110 gallons or 1,100 pounds of a regulated substance is presumed to be a nonresidential land use or activity.

Operating permit means authorization to conduct an activity regulated by this article.

Permitted pumping capacity means the amount of water authorized by the South Florida Water Management District to be pumped from a well, measured in gallons per day.

Pollutant travel time means the theoretical time required by pollutants to travel from one point to another.

Pollution means the presence of any substance (organic, inorganic, radiological or biological) or condition (temperature, pH, turbidity) in water which tends to degrade its quality so as to constitute a hazard or impair the usefulness of the water.

Potable water sources means sources of water that meet county, state or federal drinking water standards and are intended for drinking, culinary and domestic purposes.

Protection zone maps means maps showing the location on the ground of the outer limits of protection zones for present public utility potable water supply wells and wellfields which are permitted to pump 1,000,000 gallons of water per day or more. The Florida Cities-Waterway Estates Wellfield are not be included within the protections established by this article or depicted on the protection zone maps.

Protection zones means zones delineated by iso-travel time contours around wellfields, within which hazardous or toxic substances must be regulated to protect the quality of the groundwater resource. These zones are calculated based on the rate of movement of groundwater in the vicinity of wells, with an allowance for the dispersion of a pollutant entering into and moving with the groundwater.

Public potable water supply wellfield, with the exception of the Florida Cities-Waterway Estates Wellfield, means a tract of land containing a well or group of wells for which a consumptive use permit has been issued by the South Florida Water Management District, which are in use and are providing water for public consumption and which are the subject of an agreement between the county and the public utility operating the well or group of wells whereby the utility contributes its pro rata share of the administration and enforcement costs of this article. For brevity, the term "wellfield" refers to a public potable water supply wellfield.

Public utility means a privately owned, municipally owned or county-owned system providing water or wastewater service to the public which has at least 15 service connections or regularly serves an average of at least 25 individuals daily.

Regulated substances means any hazardous or toxic substance regulated under this article as described in section 14-213.

Solid waste means garbage, rubbish, refuse or other discharged solid or semisolid material resulting from domestic, commercial, industrial, agricultural or governmental land uses or activities.

Toxic substances means hazardous wastes as defined in chapter 17-730, Florida Administrative Code; hazardous substances as defined in the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, PL 96-510, 94 Stat. 2767; a pollutant as defined in F.S. ch. 376; a substance which is or is suspected to be carcinogenic, mutagenic, teratogenic or toxic to human beings, or to be acutely toxic as defined in rule 17-3.021(1), Florida Administrative Code; or a substance which poses a serious danger to the public health, safety or welfare (see rule 17-7510(35), Florida Administrative Code).

Travel time zones means the area bounded by iso-travel time contours.

Water table aquifer means an aquifer with a phreatic surface, that is, a free surface where the fluid pressure equals atmospheric pressure or zero gauge pressure, also known as a phreatic or

unconfined aquifer. It is the uppermost aquifer and can receive direct recharge from the ground surface.

Well means any excavation that is drilled, cored, bored, washed, driven, dug, jetted or otherwise constructed when the intended use of such excavation is to conduct groundwater from a source bed to the surface, by pumping or natural flow, when groundwater from such excavation is used or to be used in a public utility potable water supply wellfield (see rule 17-7510(35), Florida Administrative Code).

Wellfield means a public potable water supply wellfield.

Wellfield protection officer means the person designated and authorized under section 14-242 to supervise the implementation and enforcement of this article.

(Ord. No. 89-30, § 1(ch. 2), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Cross reference—Definitions and rules of construction generally, § 1-2.

Sec. 14-204. Penalty for violation of article; additional remedies.

Any person, or any agent or representative thereof, who violates any provision of this article will, upon conviction, be subject to the following penalties:

- (1) *Criminal penalties.* As provided in section 1-5.
- (2) *Civil penalties.* The Board of County Commissioners may institute in any court or before any administrative board of competent jurisdiction action to prevent, restrain, correct or abate any violation of this article or of any order or regulation made in connection with its administration or enforcement, and the court or administrative board will adjudge such relief by way of injunction, or any other remedy allowed by law, or otherwise, to include mandatory injunction, as may be proper under all the facts and circumstances of the case, in order to fully effec-

tuate the regulations adopted under this article and any orders and rulings made pursuant thereto.

(Ord. No. 89-30, § 2, 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-205. Conflicting provisions.

Whenever the requirements or provisions of this article are in conflict with the requirements or provisions of any other lawfully adopted ordinance or statute, the more restrictive requirements apply.

(Ord. No. 89-30, § 4, 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-206. Effective date of article; retroactive application to existing activities.

The requirements and provisions of this article will apply immediately upon the effective date of this article to all existing activities regulated under this article in the unincorporated area of the county and relate back to September 1, 1989. Existing activities include all activities that were issued a building permit or occupational license or for which a completed building permit or occupational license application was filed and accepted by the appropriate department or jurisdiction on or after September 1, 1989.

(Ord. No. 89-30, § 6, 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-207. Sunset provision.

(a) The Board of County Commissioners has adopted this article for the purpose of providing interim protection to existing potable water wellfields which are permitted to pump 1,000,000 gallons of water or more per day. The county is a member of the Lee County Regional Water Supply Authority. The authority has been established as an independent special district in part to ensure the protection of the public potable water supply. Potable water wellfields make up a portion of the available public potable water supply. In adopting this article, the board has taken the first step in the establishment of the authority and in provid-

ing an overall program for the protection of the public water supply. This article is conceived as a part of that program.

(b) In order to ensure that the wellfield protection efforts of the county are incorporated into any overall program to protect the public potable water supply, this article will remain in full force and effect until the board adopts an ordinance repealing these provisions either expressly or by implication.

(Ord. No. 89-30, § 1(ch. 10), 8-23-89; Ord. No. 90-46, § 3, 9-19-90; Ord. No. 93-19, § 1, 7-21-93; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-208. Applicability of article.

(a) This article only applies to a particular land use or activity, whether that land use or activity is classified as a residential or commercial use, when:

- (1) The aggregate sum of all quantities of any one regulated substance on a given parcel or in a certain building exceeds 110 gallons if the substance is a liquid, or 1,110 pounds if the substance is a solid; or
- (2) No single substance exceeds the limits referenced in subsection (a)(1) of this section but the aggregate sum of all regulated substances present on a given parcel or in a given building exceeds 110 gallons if the substances are liquids, or 1,110 pounds if the substances are solids.

(b) Where regulated substances are dissolved in or mixed with nonregulated substances, only the actual quantity of the regulated substance present will be used to determine compliance. Where a regulated substance is a liquid, the total volume of the regulated substance present in a solution or mixture of the substance with other substances will be determined by volume percent composition of the regulated substances.

(c) This article applies to all storage facilities for petroleum products which are not regulated by F.S. § 376.317 or chapter 17-61, Florida Administrative Code.

(Ord. No. 89-30, § 1(4.02), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-209. Exemptions from article.

(a) *General exemption.* Certain existing or proposed public and quasipublic land uses and activities may be declared exempt from the provisions of this article by the Board of County Commissioners. This exemption will be granted only upon a finding made by the board in a public meeting that the existing or proposed land use or activity serves a public need which overrides the intent and purpose of this article and that it would be economically impractical or scientifically impossible for the land use or activity to comply with the requirements of this article or be relocated to an area outside of the protection zones established by this article. When declaring such an exemption, the Board of County Commissioners will limit the exemption to the extent necessary to enable the existing or proposed public or quasipublic land use or activity in question to be conducted within a protection zone while still serving the intent and purpose of this article to the extent which is economically practical and scientifically possible. The board may attach any conditions to the grant of any exemption that it deems appropriate.

(b) *Special exemptions.* The following activities or uses are exempt from the provisions of sections 14-214(a)(2), 14-214(b)(2), 14-214(c)(2) and 14-214(d)(2):

- (1) *Application of pesticides.* The application of those regulated substances used as pesticides, herbicides, fungicides and rodenticides in recreation, agriculture, pest control and aquatic weed control activities will be exempt from the provisions of this article provided that:

- a. Application of the substance must be in strict conformity with the use requirement as set forth in the EPA registry for that substance and as indicated on the containers in which the substances are sold;
- b. The application must be in strict conformity with the requirements as set forth in F.S. chs. 482 and 487, and chapters 5E-2 and 5E-9, Florida Administrative Code;

regulated substances

Application conforms with use reg. set forth in EPA registry
PS + AC

c. The application of any of the pesticides, herbicides, fungicides and rodenticides will be flagged in the records of the certified operator supervising the use. The certified operator must provide specific notification in writing to the applicators under his supervision that they are working at a site located in protection zone 1, 2, 3 or 4, for which particular care is required. Records will be kept of the date and amount of those substances applied at each location, and the records will be available for inspection at reasonable times by the division; and

d. All nonresidential applicators of pesticides, herbicides, fungicides and rodenticides who apply those substances must obtain an operating permit covering all application operations under one permit for using those materials and comply with all the requirements as set forth in the regulations promulgated pursuant to this article.

(2) *Continuous transit.* The transportation of any regulated substance will be exempt from the provisions of this article provided that:

a. The transporting motor vehicle is in continuous transit as defined in section 14-203; or

b. The transport of such substances through existing permanent pipelines is in accordance with the regulations applicable to protection zone 1, 2 and 3 requirements within those respective zones. In protection zone 4 such activity is exempt provided that the currently authorized uses are not changed and provided that leak detection and monitoring procedures as approved by the division are employed.

(3) *Vehicular and lawn maintenance fuel and lubricant use.* The use in a vehicle or lawn maintenance, mobile construction or min-

ing equipment of any regulated substance solely as fuel in the fuel tank of a vehicle or equipment or as lubricant in that vehicle or equipment will be exempt from the provisions of this article. No operating permit is required.

(4) *Emergency services and public utilities.* Except for the maintenance and refueling of vehicles, existing fire, police, emergency medical services, county emergency management center facilities and public utilities (as defined in section 14-203) are exempt from the provisions of section 14-214(a)(1) and (2) provided they obtain an operating permit pursuant to section 14-244. No operating permit is required in protection zones 3 and 4.

(5) *Retail sales activities.* Retail sales establishments that store and handle regulated substances for resale in their original unopened containers will be exempt from the prohibition in section 14-214(a)(1) and (2) provided that those establishments obtain an operating permit pursuant to section 14-244. No operating permit is required in protection zones 3 and 4.

(6) *Office uses.* Office uses, except for the storage, handling or use of regulated substances as provided for in applicable administrative codes, will be exempt from the provisions of this article. No operating permit is required.

(7) *Construction activities.* Constructing, repairing or maintaining any facility or improvement on lands within any protection zone and earth mining within any protection zone will be exempt from the provisions of this article provided that all contractors, subcontractors, laborers, materialmen and their employees using, handling, storing or producing regulated substances in any protection zone use the applicable best management practices provided in section 14-217. No operating permit is required.

(c) *Administrative exemption.* Any person affected by this article may petition the division for an administrative exemption from the prohibitions and monitoring requirements of this article, provided that the person demonstrates by a preponderance of competent, substantial evidence that special or unusual circumstances and adequate technology exists to isolate the facility or activity from the potable water supply in the event of a spill. In granting an administrative exemption, the division may attach any appropriate conditions and safeguards which are necessary to protect the wellfield.

(Ord. No. 89-30, § 1(4.05), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-210. Vested rights.

(a) Notwithstanding any provision of this article to the contrary, any proposed or existing land use or activity which has obtained county approval prior to September 1, 1989, will be allowed to develop consistent with the development approval only after the land use or activity has obtained an operating permit. For purposes of applying this section, only the following approvals will be considered:

- (1) A final development order;
- (2) A certificate of occupancy;
- (3) A general excavation permit;
- (4) A building permit; or
- (5) A certificate of completion.

The judicially recognized standards of equitable estoppel will be applied to determine if a development should be allowed to develop consistent with prior development approval.

(b) Mining operations which have received development approvals prior to the effective date of this article will be permitted to continue with the previously approved phased activities so long as the activities are consistent with the prior approvals, and no excavation occurs within 500 feet of a wellhead. Development approvals for mining include having obtained zoning approval either as an IPD or as a special exception in the AG-2 zoning district, in addition to any other approvals listed in subsection (a) of this section.

(c) To the extent that an approved development can obtain an operating permit consistent with this article without conflicting with the specific uses or development design and construction specifications approved prior to the effective date of this article, full compliance with the operating permit requirements will be required. (Ord. No. 89-30, § 1(ch. 9), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-211. Wellfield protection zones defined.

Four types of protection zones have been established using scientific criteria relating to the physical characteristics of the water supply aquifer and the transport gradients caused by either natural forces or induced pumpage of the wellfields (see section 14-216). The transport times associated with the protection zones are designed so as to allow adequate time to carry out mitigating procedures to prevent wellfield contamination in the event of spillage of any regulated substance.

- (1) Protection zone 1 consists of all land situated between the well and the water table aquifer six-month travel time zone demarcation.
- (2) Protection zone 2 consists of all land situated between the well and the planar geometric union of the largest of the following three travel time zones:
 - a. Water table aquifer one-year travel time zone demarcation.
 - b. Lower Tamiami one-year travel time zone demarcation.
 - c. Sandstone one-year travel time zone demarcation.
- (3) Protection zone 3 consists of all land situated between the well and the planar geometric union of the largest of the following three protection zones:
 - a. Water table one-year travel time zone demarcation and the water table aquifer five-year travel time zone demarcation.

- b. Sandstone aquifer one-year travel time zone demarcation and the Sandstone aquifer five-year travel time zone demarcation.
 - c. Lower Tamiami one-year travel time zone demarcation and the Lower Tamiami five-year travel time zone demarcation.
- (4) Protection zone 4 consists of all land situated between the well and the planar geometric unit of the largest of the following three protection zones:
- a. Water table five-year travel time zone demarcation and the water table aquifer ten-year travel time zone demarcation.
 - b. Sandstone five-year travel time zone demarcation and the Sandstone ten-year travel time zone demarcation.
 - c. Lower Tamiami five-year travel time zone demarcation and the Lower Tamiami ten-year travel time zone demarcation.

(Ord. No. 89-30, § 1(3.01), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-212. Protection zone maps.

(a) *Adoption.* The protection zone maps have been developed by the county and are hereby adopted by reference and made a part of this article. The official protection zone maps will be placed on file at the division office. Reproductions of the maps will be made available for sale at division offices, the office of land information services or other appropriate county agency.

(b) *Interpretation of zone designation.* To determine the location of properties and buildings within the protection zones delineated on the protection zone maps, the following rules will apply:

- (1) Properties located wholly within one protection zone reflected on the applicable protection zone maps are governed by the restrictions applicable to that zone.
- (2) Properties having parts lying within more than one zone as reflected on the applica-

ble protection zone maps are governed by the restrictions applicable to the protection zone in which each part of the property is located.

- (3) Where a travel time contour which delineates the boundary between two protection zones passes through a building, the entire building is considered to be in the more restrictive zone.
- (4) Where the building or portion thereof is overlapped by protection zones of different wells or wellfields, the most restrictive regulations apply.
- (5) Where a property or portion thereof is overlapped by protection zones of different wells or wellfields, the most restrictive of the regulations will prevail over the overlapped area.

(c) *Annual review.* The protection zone maps will be reviewed at least annually by the division. Any amendments, additions or deletions to the maps must be approved by the Board of County Commissioners as amendments to this article. Copies of the maps will be made available to the appropriate divisions of the county and to the county health department, the Southwest Florida Regional Planning Council, the South Florida Water Management District and any other agency requesting the maps. The basis for amending the maps may include but is not limited to the following:

- (1) Changes in the technical knowledge concerning the aquifers of the county.
- (2) Changes in the pumping rate of wellfields.
- (3) Wellfield reconfiguration.
- (4) The addition of new wells to a wellfield.
- (5) Approval by the Board of County Commissioners of additional wellfields.

(Ord. No. 89-30, § 1(3.02), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-213. Regulated hazardous or toxic substances.

Regulated substances include but are not limited to those deleterious substances and contaminants which have one or more of the following characteristics:

- (1) Substances, including degradation and interaction products, which because of quality, concentration or physical or chemical characteristics (including ignitability, corrosivity, reactivity and toxicity), infectious characteristics, radioactivity, mutagenicity, carcinogenicity, teratogenicity, bioaccumulative effect, persistence (nondegradability) in nature, or any other characteristic relevant to a particular material may cause significant harm to human health or the environment, including surface water and groundwater, plants or animals;
 - (2) Those substances set forth in the following lists, as amended from time to time: Lists of Hazardous Waste (40 CFR part 261, subpart D); 40 CFR 261, Appendix VIII—Hazardous Constituents; and EPA Designation Reportable Quantities and Notification Requirements for Hazardous Substances Under CERCLA (40 CFR 302);
 - (3) Exhibit any of the characteristics identified in 40 CFR 261.20—261.24;
 - (4) Are priority toxic pollutants listed in 40 CFR 122.21 by the EPA;
 - (5) Contain a degradation product which is toxic, including petroleum-based products;
 - (6) Are restricted-use pesticides as that term is used in F.S. ch. 487, and which are listed in chapters 5E-2 and 5E-9, Florida Administrative Code;
 - (7) Contain brackish or saline water which contains total dissolved solids in excess of 1,000 parts per million and chlorides in excess of 500 parts per million; or
 - (8) Are raw or partially treated sewage.
- (Ord. No. 89-30, § 1(4.03), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-214. Prohibited and regulated activities within protection zones.**(a) Protection zone 1.****(1) Prohibitions.** Except as provided in section 14-209, the following land uses or activities are prohibited in protection zone 1:

- a. The use, handling, production or storage of regulated substances associated with land uses or activities regulated by this article in quantities greater than those set forth in section 14-208(a).
- b. Wastewater effluent disposal, except for public access reuse of reclaimed water and land application under the conditions set forth and as defined in chapter 17-610, part III, Florida Administrative Code. Where public access reuse is permitted the chloride content must be no greater than 500 milligrams per liter.
- c. Liquid waste disposal.
- d. Solid waste disposal.
- e. Earth mining within a 500-foot radius of an existing wellhead.

(2) Regulations.

- a. Except as provided in section 14-209, all persons who engage in land uses or activities regulated under this article who store, handle, use or produce any of the regulated substances (excluding partially treated sewage from residential septic tank systems) within protection zone 1, in quantities greater than those set forth in section 14-208(a), will cease to do so within 90 days of the effective date of this article pursuant to the prohibitions set forth in this article, unless such persons obtain an operating permit authorizing the continuation of such land use or activity within the 90-day deadline. A closure permit (see section 14-245) will otherwise be obtained from the division and a timetable for discontinu-

ance and closure must be submitted to the wellfield protection officer in accordance with the requirements of this article.

- b. The owners of any sanitary sewer, force main, gravity sewer or lateral must notify the division of any break in the sewer lines within 24 hours of discovering such a break. The purpose of this requirement is to allow the division to monitor repairs to the line and any necessary cleanup activities. Any stormwater or surface water discharge within this protection zone will conform to existing South Florida Water Management District and state department of environmental protection rules, as they may be amended or replaced.

(b) *Protection zone 2.*

- (1) *Prohibitions.* Except as provided in section 14-209, the following land uses or activities are prohibited in protection zone 2:

- a. The use, handling, production or storage of regulated substances associated with activities regulated by this article in quantities greater than those set forth in section 14-208(a).
- b. Wastewater effluent disposal, except that public access reuse of reclaimed water and land application under the conditions set forth and as defined in chapter 17-610, part III, Florida Administrative Code, will be permitted. Where public access reuse is permitted the chloride content will be no greater than 500 milligrams per liter.
- c. Liquid waste disposal.
- d. Solid waste disposal.
- e. Earth mining within a 500-foot radius of an existing wellhead.

- (2) *Regulations.* Except as provided in section 14-209, all persons who engage in land uses or activities regulated under this article who store, handle, use or pro-

duce any of the regulated substances (excluding partially treated sewage from residential septic tank systems), or who own or undertake any of the activities regulated under this article will cease to do so within 90 days of the effective date of this article pursuant to the prohibitions set forth in this article, unless such persons obtain an operating permit authorizing the continuation of such land use or activity within the 90-day deadline. A closure permit will otherwise be obtained from the division and a timetable for discontinuance and closure must be submitted to the wellfield protection officer in accordance with section 14-245. Any stormwater or surface water discharge within this protection zone will conform to existing South Florida Water Management District and state department of environmental protection rules, as they may be amended or replaced.

(c) *Protection zone 3.*

- (1) *Prohibitions.* Except as provided in this article, the following land uses or activities are prohibited in protection zone 3:

- a. Any activity regulated by this article which stores, handles, uses or produces any regulated substance in quantities greater than those set forth in section 14-208(a), which does not have a valid operating permit as set forth in section 14-244.
- b. Wastewater effluent disposal, except that public access reuse of reclaimed water and land application under the conditions set forth in chapter 17-610, part III, Florida Administrative Code, will be permitted. Where public access reuse is permitted the chloride content must be no greater than 500 milligrams per liter.
- c. Liquid waste disposal.
- d. Solid waste disposal.

- (2) *Regulations.*

- a. Except as provided in section 14-209, all persons in protection zone 3

who store, handle, use or produce any regulated substance on the effective date of this article, or any new land use or activity established thereafter, may continue to do so in accordance with the provisions and exemptions set forth in this article upon obtaining an operating permit pursuant to section 14-244.

- b. Within 90 days of the effective date of this article, all land uses or activities regulated by this article and located within protection zone 3 will make application for an operating permit from the division in compliance with the provisions of this article. Activities requesting an administrative exemption (see section 14-209(c)) or a closure permit (see section 14-245) will have a period of 120 days from the effective date of this article to make application. If after 180 days all the requirements necessary for the issuance of an operating permit have not been completed and the applicant has made a diligent effort to do so, an operating permit may be issued contingent on compliance by a date certain. All operating permits must be renewed annually and will be subject to the conditions set forth in section 14-244. Any stormwater or surface water discharged within this protection zone will conform to existing South Florida Water Management District and state department of environmental protection rules, as they may be amended or replaced.

(d) *Protection zone 4.*

- (1) *Prohibitions.* Except as provided in section 14-209, any activity regulated by this article which stores, handles, uses or produces any regulated substance in quantities greater than those set forth in section 14-208(a), which does not obtain a valid operating permit as set forth in section 14-244, is prohibited in protection zone 4.

(2) *Regulations.*

- a. Except as provided in section 14-209, any land use or activity involving the storage, handling, production or use of regulated substances in protection zone 4, in existence on the effective date of this article, or any new land use or activity established thereafter, must obtain an operating permit.
- b. Within 90 days of the effective date of this article, all persons who engage in land uses or activities regulated by this article within protection zone 4 who store, handle, use or produce any regulated substances will obtain an operating permit from the division and will comply with the provisions of this article and the regulations promulgated pursuant to this article. All operating permits must be renewed annually. Any stormwater or surface water discharge within this protection zone will conform to existing South Florida Water Management District and state department of environmental protection rules, as they may be amended or replaced.

(Ord. No. 89-30, § 1(4.04), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-215. Abandoned wells.

(a) The division will initiate a program that will result in the plugging of any wells that have been abandoned and that lie within the ten-year travel time of any well or wellfield protection zone as well as the Mid-Hawthorne Aquifer System. The program will include:

- (1) An inventory, to be conducted by the division, of all known abandoned or out-of-use wells lying within the ten-year travel time of any well or wellfield regulated by this article in the unincorporated area of the county.
- (2) A procedure for notifying by registered mail the owners of properties within whose boundaries such abandoned wells are lo-

cated. The property owners will be notified within 30 days of the discovery of such wells. The letter of notification will include but not be limited to the following:

- a. Notice that an abandoned well exists on his property and that the county plans to properly plug the well.
- b. Approximate dates during which the county will plug the well and that county staff will require access to the property.

(b) Abandoned wells on any property lying within the ten-year travel time zone of any well regulated by this article will be plugged in accordance with the provisions of Ordinance No. 87-7 of the county, as amended, renumbered or replaced.

(Ord. No. 89-30, § 1(4.06), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-216. Criteria for establishing protection zones.

(a) The protection zone maps have been developed based on steady state groundwater flow and transient contaminant transport to wells or wellfields regulated by this article that considers all, but not exclusively, the following factors:

- (1) Mathematical solution considers three-dimensional flow of a homogeneous, incompressible fluid through a nonhomogeneous, anisotropic aquifer.
- (2) Confined and unconfined aquifer flow conditions are applied as appropriate in layered aquifers calibrated to the county's hydrogeologic conditions for steady state, regional flow.
- (3) Area-specific values of hydrogeologic parameters including both horizontal and vertical hydraulic conductivity are used.
- (4) Aquifer-specific values of contaminant transport parameters, including longitudinal and transverse dispersivity coefficients, and effective porosity are used.
- (5) Recharge from rainfall is assigned to be zero to establish conservative calculations of the protection zones.

- (6) Conservative contaminants that do not decay and do not absorb to the porous medium are assumed.
- (7) Wellfield locations, and well locations within wellfields, are specified.
- (8) Wellfield pumping rates are assigned as the greater of the average annual rate permitted the South Florida Water Management District or the maximum historical average annual rate, but not more than the present estimated capacity.
- (9) Pumpage is distributed among individual wells in a wellfield by prorating total pumpage based on the present estimated capacity of each well.
- (10) Identification of travel time contours is determined by determining distances where contamination would have been six months, one year, five and ten years in the past if theoretical contamination appeared in wells at the present. The travel time zones incorporate the influence of both the wellfield zone of influence due to pumping and the regional groundwater flow gradient.

(b) The protection zones indicated on the protection zone maps are the planar geometric union of the largest of the travel time protection zones determined as follows:

- (1) *Water table (surficial) aquifer system.*
 - a. Water table, six-months: The land situated between an existing public water supply well and the six-month travel time contour.
 - b. Water table, one-year: The land area situated between the well and the one-year travel time contour.
 - c. Water table, five-year: The land area situated between the well and the five-year travel time contour.
 - d. Water table, ten-year: The land area situated between the well and the ten-year travel time contour.
- (2) *Lower Tamiami (surficial) aquifer system.*

- a. Lower Tamiami, one-year: The land area situated between an existing public water supply well and the one-year travel time contour.
- b. Lower Tamiami, five-year: The land area situated between the well and the five-year travel time contour.
- c. Lower Tamiami, ten-year: The land area situated between the well and the ten-year travel time contour.

(3) *Sandstone (intermediate) aquifer system.*

- a. Sandstone, one-year: The land area situated between an existing public water supply well and the one-year travel time contour.
- b. Sandstone, five-year: The land area situated between the well and the five-year travel time contour.
- c. Sandstone, ten-year: The land area situated between the well and the ten-year travel time contour.

(4) *Mid-Hawthorne (intermediate) aquifer system.* Mid-Hawthorne, ten-year: The land situated between existing public water supply wells and the ten-year travel time contour.

(c) The aquifers referenced in this article are identical to those listed in the report titled "Final Report, Wellfield Protection Modeling, Lee County, Florida," Camp, Dresser and McKee, Inc., November 1987.

(Ord. No. 89-30, 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-217. Best management practices for the construction industry.

(a) The general contractor, or, if none, the property owner, will be responsible for ensuring that each contractor or subcontractor evaluates each site before construction is initiated to determine if any site conditions may post particular problems for the handling of any regulated substances. For instance, handling regulated substances in the proximity of water bodies or wetlands may be improper.

(b) If any regulated substances are stored on the construction site during the construction process, they must be stored in a location and manner which will minimize any possible risk of release to the environment. Any storage containers of 55 gallons, or 440 pounds, or more containing regulated substances must have constructed below them an impervious containment system constructed of material of sufficient thickness, density and composition that will prevent the discharge to the land, groundwaters or surface waters of any pollutant which may emanate from the storage tanks. Each containment system must be able to contain 150 percent of the contents of all storage containers above the containment system.

(c) Each contractor will familiarize himself with the manufacturer's safety data sheet supplied with each material containing a regulated substance and will be familiar with procedures required to contain and clean up any releases of the regulated substance. Any tools or equipment necessary to accomplish such containment and cleanup must be available in case of a release.

(d) Upon completion of construction, all unused and waste-regulated substances and containment systems will be removed from the construction site by the responsible contractor and must be disposed of in a proper manner as prescribed by law.

(Ord. No. 89-30, 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Secs. 14-218—14-240. Reserved.

DIVISION 2. ADMINISTRATION AND ENFORCEMENT

Sec. 14-241. Authority and duties of division of natural resources management.

(a) The division of natural resources management will administer and enforce the provisions of this article.

(b) The division will perform the following duties:

- (1) The division director will recommend revisions and amendments to this article as necessary.
- (2) The division will make continuing studies and periodic reports and recommendations for the improvement of wellfield protection controls throughout the unincorporated area of the county, and work in cooperation with federal, state and local agencies and groups interested in the field of wellfield protection.
- (3) The division will recommend revisions and updates to the list of hazardous and toxic substances incorporated into this article and the wellfield protection zone maps to the Board of County Commissioners.
- (4) The division will investigate wellfield protection programs and activities in operation in other areas and make recommendations for the improvement of the regulation, administration and enforcement of wellfield protection.
- (5) The division will publicize the importance of adequate wellfield protection, participate in public hearings, discussions, forums and institutes, and arrange programs for the presentation of information by experts in the field of wellfield protection, subject to budget limitations.
- (6) The division will establish a permitting system for activities subject to this article.
- (7) The division will perform such other duties, functions and responsibilities related to wellfield protection that may be assigned from time to time by the county administrator.

(Ord. No. 89-30, § 1(5.01), (5.02), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-242. Wellfield protection officer.

(a) *Generally.* A wellfield protection officer within the division will be designated to supervise the implementation and enforcement of this arti-

cle. The wellfield protection officer will designate such inspectors as are necessary to enforce this article and will have all necessary powers and authority of enforcement.

(b) *Duties.* The wellfield protection officer's duties and responsibilities are to:

- (1) Enforce the provisions of this article.
- (2) Investigate alleged infractions of this article, study and observe conditions, and make recommendations as to the institution of actions necessary for the protection of potable water supply wellfields and as to the prosecution of any violations of this article.
- (3) Make appropriate surveys, tests and inspections of property, facilities, equipment and processes operating under the provisions of this article to determine whether the provisions of this article are being complied with, and make recommendations for methods by which wellfield protection may be enhanced.
- (4) Maintain, review and supervise all operating records required to be filed by persons operating facilities subject to the provisions of this article.
- (5) Establish technical guidelines and criteria for permitting requirements.
- (6) Render all possible assistance and technical advice to persons operating facilities and processes, the use of which may endanger wellfields; except that the wellfield protection officer will not design equipment or facilities for any person.
- (7) Publish and disseminate information to the public concerning environmental quality and recommend methods for decreasing and eliminating pollution.
- (8) Render all possible cooperation and assistance to federal, state and local agencies for the effective protection of potable water wellfields.
- (9) Enlist and encourage public support, assistance of civic, technical, scientific and

educational organizations and cooperation of industrial and business enterprises and organizations.

- (10) Make periodic reports concerning the status of wellfield protection throughout the county.
 - (11) Perform such other administrative duties related to wellfield protection as may be necessary.
- (Ord. No. 89-30, § 1(5.03), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-243. Building permits and occupational licenses.

(a) *Review by division.*

- (1) The division will provide a list to all county agencies of potentially prohibited land uses or activities in each protection zone. It will be the duty of each county agency to screen all applications for an occupational license requested by an individual or business located within any protection zone.
- (2) Every application for a rezoning, special exception, occupational license, change of occupancy, development order, certificate of occupancy or building permit must indicate whether or not the property, or any portion thereof, lies within a protection zone.
- (3) Every application which involves property located wholly or partially within a protection zone will be reviewed by the division. The division will then issue a notice as to whether or not the proposed land use or activity meets the applicable requirements of this article.
- (4) No request for a rezoning, special exception, special permit, development order, certificate of occupancy, building permit, change of occupancy or occupational license for any activity regulated by this article will be issued that is contrary to the restrictions and provisions provided in this article. Permits or occupational licenses issued in violation of this section

confer no right or privilege on the grantee, and such invalid permits or licenses will not vest rights.

(b) *Records.* Copies of all building permits for principal buildings and all occupational licenses issued for land uses or activities located within the protection zones will be submitted to the division on a quarterly basis.

(Ord. No. 89-30, § 1(6.01), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-244. Operating permit.

(a) *Required information.* All applications for operating permits must contain, at a minimum, the following information:

- (1) If the application is for an exemption, a concise statement by the applicant detailing the circumstances upon which the applicant believes it is exempt from this article pursuant to section 14-209.
- (2) A list of all substances qualifying as either regulated or generic substances which are to be stored, handled, used or produced in conjunction with the land use or activity being permitted, and the quantity to be stored, handled, used or produced.
- (3) A detailed description of the activities that involve the storage, handling, use or production of the regulated substances, indicating the unit quantities in which the substances are contained or manipulated.
- (4) A description of the containment, the emergency collection devices and containers and emergency plan that will be employed to comply with the restrictions required for protection zones 3 and 4 as set forth in subsection (b) of this section.
- (5) A description of the daily monitoring activities that have been or will be instituted to comply with the restrictions for protection zones 3 and 4 as set forth in subsection (b) of this section.
- (6) A description of the maintenance that will be provided for the containment facility, monitoring system and emergency equip-

ment required to comply with the restrictions of protection zones 3 and 4 as set forth in subsection (b) of this section.

- (7) A description of the groundwater monitoring wells, including the latitude and longitude, that have been or will be installed, and the arrangements made or which will be made for certified quarterly analyses for specified regulated substances.
- (8) An agreement to indemnify and hold the county harmless from any and all claims, liabilities, causes of action or damages arising out of the issuance of the permit. The county will provide reasonable notice to the permittee of any such claims.

(b) *Conditions.*

- (1) *Authority to impose conditions.* The division may place conditions on any permit so as to ensure compliance with all of the prohibitions, restrictions and requirements set forth in this article. Such conditions may include but are not limited to requiring monitoring wells, periodic groundwater analysis reports and compliance schedules.
- (2) *Minimum conditions.* Any operating permit issued by the division will contain the following minimum conditions:
 - a. *Compliance with article.* The land use or activity must comply with the provisions of this article.
 - b. *Groundwater monitoring.* Every activity regulated by this article must install one or more groundwater monitoring wells as determined by and in a manner approved by the division, at its own expense. The division will have the right to inspect and sample the monitoring wells. Certified analytical results of the quantity present in each monitoring well of each of the regulated substances listed in the regulated land use or activity's operating permit must be filed quarterly with the division. The presence of any of the regulated substances in a monitor-

ing well will be used to ascertain the source of any accumulation appearing in a potable water well. However, the absence of the regulated substances in a monitoring well will not be used as the basis to exempt any regulated activity from the mandatory actions set forth in section 14-244(c).

- c. *Containment of regulated substances.* Leakproof trays under containers; floor curbing or other containment systems to provide secondary liquid containment must be installed. The containment will be of adequate size to handle all spills, leaks, overflows and precipitation until appropriate action can be taken. The specific design and selection of materials must be sufficient to preclude any regulated substance loss to the external environment. Containment systems will be sheltered so that the intrusion of precipitation is effectively prevented, and adequate and appropriate liquid collection methods rather than sheltering will be used only after approval of the design by the division. These requirements will apply to all areas of use, production and handling, to all storage areas, to loading and off-loading areas, and to aboveground and underground storage areas. The containment devices and liquid collection systems will be certified in the operating permit application by a professional engineer registered in the state or professional geologist licensed in the state.
- d. *Emergency collection devices.* Vacuum suction devices, absorbent scavenger materials or other devices approved by the division must be present on-site or available within two hours, or one hour in protection zones 1 and 2, by contract with a cleanup company approved by the division. Devices or materials will be available in sufficient magnitude so

as to control and collect the total quantity of regulated substances present. To the degree feasible, emergency containers will be present and of such capacity as to hold the total quantity of regulated substances plus absorbent material. The presence of such emergency collection devices will be certified in the operating permit application for existing activities. Such certification for new activities must be provided to the division prior to the presence of regulated substances on the site. Certification will be provided by a professional engineer registered in the state or professional geologist licensed in the state.

- e. *Emergency plan.* The emergency plan prepared and filed with the operating permit application must indicate the procedures which will be followed in the event of spillage of a regulated substance so as to control and collect all such spilled material in such a manner as to prevent it from reaching any storm or sanitary drains or the ground.
- f. *Inspection.* A responsible person designated by the permittee who stores, handles, uses or produces the regulated substance will check, on every day of operation, for breakage or leakage of any container holding the regulated substances. Electronic sensing devices may be employed as part of the inspection process, if approved by the division, and provided the sensing system is checked daily for malfunctions. The manner of daily inspection will not necessarily require physical inspection of each container provided the location of the containers can be inspected to a degree which reasonably assures the division that breakage or leakage can be detected by the inspection. Monitoring records will be kept and made available to the division at all reasonable times for examination.

- g. *Maintenance of containment and emergency equipment.* Procedures will be established for the quarterly in-house inspection and maintenance of containment and emergency equipment. Such procedures must be in writing. A regular checklist and schedule of maintenance will be established and a log will be kept of inspections and maintenance. Such logs and records will be kept available for inspection by the division.

(c) *Issuance; duration; renewal fee.*

- (1) Within 30 working days of receipt of an application for an operating permit, the division will inform the applicant whether such application contains sufficient information for a proper determination to be made. If the application is found to be insufficient, then the division will provide the applicant with a written statement, sent by certified mail or hand delivery, requesting the additional information required. The applicant will inform the division within ten working days of the date of the written statement of his intent to either furnish the information or have the application processed as it stands. The division will have 90 working days to review the application from either the date the application is deemed sufficient or the date the applicant declines to furnish additional information requested by the division, whichever is later.
- (2) All land uses or activities owned or operated by one person which are located on contiguous parcels of property may be covered under one permit. The term "contiguous," for purposes of this subsection, means abutting parcels and parcels which are separated by a public or private road.
- (3) An application which satisfies the requirements of the applicable protection zone and this article will be approved and a permit issued. In addition to denying a permit based on failure to satisfy the requirements of this article, the division

may deny a permit based on repeated violations of this article by the person applying for the permit.

- (4) An operating permit will remain valid for one year provided the permittee is in compliance with the terms and conditions of the permit.
- (5) The permittee will not be required to pay annual renewal fees until September 1, 1989. Beginning September 1, 1989, all current and future permittees are subject to an annual renewal license fee.
- (6) A notarized agreement to comply with the provisions of section 14-246 will be submitted, as applicable.

(d) *Transfer.* Any permit may be transferred upon written notice to and approval by the division. The division will assess a permit transfer fee as set out in the appropriate county administrative code. The permit holder will request transfer of the permit upon lease, sublease, assignment, sale or change of ownership of the entity conducting the regulated land use or activity.

(Ord. No. 89-30, § 1(6.02), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-245. Closure permit.

(a) *Required information.* Closure permit applications must provide the following information:

- (1) A schedule of events to complete the closure of land use or activity that does or did store, handle, use or produce regulated substances. As a minimum, the application will address the following:
 - a. Disposition of all regulated substances and contaminated containers.
 - b. Cleanup of the activity and environs to preclude leaching of unacceptable levels of residual regulated substances into the aquifer.
 - c. Certification by a professional engineer registered in the state or professional geologist licensed in the state that disposal and cleanup have

been completed in a technically acceptable manner. Certification may be waived if the applicant provides evidence to the division that all of the following conditions apply to the subject land use or activity:

1. The entire operation is maintained inside the buildings of the facility.
2. The standard method of removing operating waste is not by septic tank, sewer mains or floor drains.
3. There is no evidence of spills permeating floors or the environs.
4. There are no outstanding or past notices of violation from any regulatory agency concerned with hazardous, industrial or special waste.
5. There is no evidence of past contamination in the public drinking water wells associated with a facility located in protection zone 1 or 2.

The applicant must provide a sworn statement that disposal and cleanup have been completed in a technically acceptable manner.

- (2) An appointment for an inspection by the division.
- (3) An agreement to indemnify and hold the county harmless from any and all claims, liabilities, causes of action or damages arising out of the issuance of the permit. The county will provide reasonable notice to the permittee of any such claims.

(b) *Conditions.* The division may place conditions on any permit so as to ensure compliance with all of the prohibitions, restrictions and requirements of this article. Such conditions may include but are not limited to monitoring wells, periodic groundwater analysis reports and compliance schedules. A closure permit may include conditions which require reduction of the risk in

the interim of contamination of the groundwaters, taking into account cost, likely effectiveness and degree of risk to the groundwater.

(c) *Well reconfiguration.* Well reconfiguration will be evaluated by the division and the affected utility as an alternative to requiring a closure permit during the permit application process.

(d) *Notice to other agencies.* The state department of environmental protection and the county public health unit will be advised in writing of each closure permit application.
(Ord. No. 89-30, § 1(6.03), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-246. Bond.

(a) Upon adoption of an appropriate county administrative code, no permit required under this article will be issued unless there is filed at the time of application, except in the case of an application by a political subdivision or agency of the state, a cash bond, rate bond or letters of credit with a corporate surety in an amount required by that code to ensure that:

- (1) The permittee will operate its activities or closure of such activities, as applicable, in accordance with the conditions and requirements of this article and permits issued under this article.
- (2) The permittee will reimburse the county for any and all expenses and costs which the county incurs as a result of the permittee failing to comply with the conditions and requirements of this article.

(b) Before a bond or letter of credit is accepted by the division as being in compliance with this section, the bond or letter of credit must be reviewed and approved by the county attorney's office and then be filed with the clerk of the Board of County Commissioners.

(c) The bond or letter of credit required by this section must be kept in full force and effect for the term of the permit and for one year after voluntary cessation of activities permitted under this article or expiration or revocation of the permit. Failure to keep a bond or letter of credit in full

force and effect as required in this section is grounds for revocation of the underlying permit or exemption.

(Ord. No. 89-30, § 1(6.05), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-247. Monitoring of presence of regulated substances.

(a) *Required.* Groundwater monitoring wells must be provided at the expense of the permittee in a manner, number and location approved by the division. Except for existing monitoring wells found by the division to be adequate for this purpose, the required wells will be installed by a county-licensed water well contractor or county-licensed monitoring well specialty contractor. Samples will be taken by a department of health and rehabilitative services approved laboratory performing the analyses. Analytical reports prepared by a department of health and rehabilitative services approved laboratory for each monitoring well will list the quantity of the regulated substances listed in the activity's operating permit and will be filed at least annually. Analytical reports may be required more frequently, as determined by the division, based upon site conditions and operations.

(b) *Enforcement actions.* If one or more of the regulated substances listed in the operating permit appear in a potable water well or in a monitoring well in an amount which exceeds the limits for that substance set out in the operating permit at any time, then the division will require one of the following mandatory actions:

- (1) All persons who engage in land uses or activities regulated by this article within the affected protection zone 3 or 4 who store, handle, use or produce the regulated substances must cease to do so within 90 days of written notification from the division. If the responsible activity can be identified, then only that activity will be subject to these mandatory actions. If the owner or operator of any activity can present acceptable technical data to the division that substantiates that the activity is not the source of the regulated substances appearing in the potable water well or in the monitoring well in

excessive amounts, that activity will not be subject to these mandatory actions. No new regulated substances may be introduced in the place of the regulated substance removed to comply with cessation; or

- (2) The affected wells will be reconfigured by changing the pumping rates or relocating the wells in such a way that the affected activity is no longer within the protection zones.

(Ord. No. 89-30, § 1(6.04), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-248. Alteration or expansion of use.

The division must be notified in writing prior to the expansion, alteration or modification of any land use or activity holding an operating permit. Such expansion, alteration or modification may result from increased square footage of production or storage capacity, or increased quantities of regulated substances, or changes in types of regulated substances, beyond those square footages, quantities and types upon which the permit was issued. The division need not be notified prior to alteration or modification of changes in types of regulated substances used in a laboratory designated as such in the currently valid permit which do not exceed the nonaggregate limits set out in division 1 of this article. If a facility adds new regulated substances which individually are below the nonaggregate substance limits in division 1 of this article, it must notify the division on an annual basis of the types and quantities of such substances added and the location of the use, handling, storage and production of such substances. If the aggregate quantity of such additions exceed the aggregate limit in division 1 of this article, no notification other than the annual notification described in this subsection is required. Any such expansion, alteration or modification must be in strict conformity with this article. Furthermore, except as provided in this article, any existing operating permit must be amended to reflect the introduction of any new regulated substances resulting from the change. However, the introduction of any new regulated substance will not prevent the revocation or revision of any existing operating permit if, in the

opinion of the division, such introduction substantially or materially modifies, alters or affects the conditions upon which the existing operating permit was granted or the ability of the land use activity to continue to qualify for an exemption, if applicable, or to continue to satisfy any conditions that have been imposed as part of an exemption, if applicable. The division will notify the permittee in writing within 60 days of receipt of the permittee's notice that the division proposes to revoke or revise the permit, stating the grounds therefor.

(Ord. No. 89-30, § 1(6.07), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-249. Reconstruction of damaged facilities.

(a) Reconstruction of any portion of a structure or building in which there is any land use or activity subject to the provisions of this article and which is damaged by fire, vandalism, flood, explosion, collapse, wind, war or other catastrophe must be in strict conformity with this article.

(b) Within 90 days of the receipt of written notice from the division, all existing land uses or activities regulated by this article which use, handle, store or produce regulated substances will file an application for an operating permit. Any such land use or activity which fails to apply for an operating permit will file for a closure permit or exemption within 120 days of the receipt of written notice from the division. The permit application must be prepared and signed by a professional engineer registered in the state or professional geologist licensed in the state. Within 30 days of receipt of the notice, the owner or operator will file with the division proof of retention of the engineer or geologist. If application is made for an operating permit, such permit will be issued or denied within 60 days of the filing of the completed application. If the application for an operating permit is denied, then the activity must cease within 12 months of the denial and an application for a closure permit will be filed with the division within 120 days of the denial of the operating permit.

(Ord. No. 89-30, § 1(6.08), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-250. Exceptions to permit requirements.

(a) *Eligibility.* Activities with adequate technology to isolate the land use or activity from the potable water supply and protect the wellfield may apply for a special exception from the operating or closure permitting requirements of this article.

(b) *Procedure for granting exception.*

(1) *Application generally.*

- a. A special exception application claiming special or unusual circumstances and adequate protection technology may be filed with the division. It will be signed by the applicant and a professional engineer registered in the state or a professional geologist licensed in the state.
- b. Such application will contain a concise statement by the applicant detailing the circumstances which the applicant feels would entitle him to a special exception.
- c. A fee as determined by the applicable administrative code must be filed with the application to defray the costs of processing such application.

(2) *Contents of application.* The application for a special exception must contain but not be limited to the following elements:

- a. The application must include a description of the situation at the site requiring isolation from the wellfield, including:
 1. A list of the regulated substances in use at the site.
 2. A site plan of the facility, including all storage, piping, dispensing, shipping, etc., facilities.
 3. A description of the operations at the facility which would involve regulated substances which must be isolated from the wellfields.
 4. The location of all operations involving regulated substances.

5. A sampling and analysis of the groundwater on the site of the activity seeking a special exception, to determine if any regulated substances are already present which constitute a threat to the water supply.

6. An analysis of the affected well showing whether or not such well is already contaminated by any regulated substances and the extent of such contamination.

7. A hydrogeologist's assessment of the site, which must address, as a minimum, soil characteristics and groundwater levels, directional flow and quality.

b. The application must include a technical proposal to achieve the required isolation, including:

1. The components to be used and their individual functions.
2. The system tying the components together.
3. A discussion and documentation, such as published technical articles, substantiating the performance and reliability of the components individually and the system as a whole. If the system has not been field tested, a discussion and laboratory test documentation to substantiate the proposed performance and reliability of the system must be included.
4. Details of the specific plans to install the system at the site.

c. If the proposed system does not have a proven history of successful in-field operation, it may still be proposed using proven components. A test plan for the system as installed shall be provided to provide that the proposed system works in the field.

- d. The application must include a technical proposal for backup detection of regulated substances that may elude the isolation system and escape to outside a perimeter to be established by division. Such proposal will include emergency measures to be initiated in case of escape of regulated substances.
 - e. Site-specific, system performance criteria must be proposed to ascertain the success of the system. Such criteria will include but are not be limited to:
 - 1. Performance.
 - 2. Reliability.
 - 3. Level of maintenance.
 - 4. Level of sensitivity to regulated substances.
 - 5. Effect of rain, flood, power failure or other natural disaster.
 - f. The applicant must provide information on the on-site availability of substance removal technologies sufficient to remediate any introduction of regulated substances into the water table at the site. Where the water is removed from on-site wells during the remedial process, a plan will be proposed for the disposal of such water.
 - g. A closure plan must be provided if the system does not prove successful in the testing required in this subsection.
 - h. The application will include any other reasonable information deemed necessary by division due to site-specific circumstances.
- (3) *Review of application.* Within 30 working days of receipt of an application for special exception, the division will inform the applicant whether such application contains sufficient information for a proper determination to be made. If the application is found to be insufficient, then the division will provide to the applicant a

written statement, by certified mail or hand delivery, requesting the additional information required. The applicant will inform the division within ten working days of the date of the written statement of his intent to either furnish the information or have the application processed as it stands.

(c) *Conditions.*

- (1) Any special exception granted by the division will be subject to the applicable conditions of this article and any other reasonable and necessary special conditions imposed by the division.
 - (2) An operating permit will be issued by the division with the applicable conditions of this article and any other reasonable and necessary special conditions imposed by the division. Such special exceptions will be subject to revocation or revision by the division for violation of any condition of the special exception by first issuing a written notice of intent to revoke or revise, sent by certified mail, return receipt requested, or hand delivery. Upon revocation or revision, the activity will immediately be subject to the enforcement provisions of this article.
 - (3) Special exceptions for protection zones 1 and 2 are for existing activities only. No new activity will be permitted into protection zones 1 and 2 after September 1, 1989, if the new activity is regulated by this article.
- (Ord. No. 89-30, § 1(7.01)–(7.03), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-251. Revocation or revision of permit or exemption.

(a) *Revocation.* Any permit or exemption issued under the provisions of this article will not become vested in the permittee. The division may revoke any permit issued by it by first issuing a written notice of intent to revoke, sent by certified, mail return receipt requested, or hand delivery, if it finds that:

- (1) The permit holder has failed or refused to comply with any of the provisions of this

article, including but not limited to permit conditions and bond requirements of section 14-246;

- (2) The permit holder has submitted false or inaccurate information in the operating permit application;
- (3) The permit holder has failed to submit operational reports or other information required by this article;
- (4) The permit holder has refused lawful inspection under section 14-252(a)(4); or
- (5) The permit is otherwise subject to revocation under this article.

(b) *Revision.* The division may revise any permit pursuant to subsection (a) of this section or by first issuing a written notice of intent to revise, sent by certified mail, return receipt requested, or hand delivery.

(c) *Spills.* Any spill of a regulated substance must be reported by telephone to the division, and to the designated public utility, within one hour of discovery of the spill. Cleanup will commence immediately upon discovery of the spill. A full written report including the steps taken to contain and clean up the spill will be submitted to the division within 15 days of discovery of the spill. Within 30 days of any spill of a regulated substance in protection zone 1, 2 or 3, the division will consider revocation or revision of the permit. Upon such consideration the division may issue a notice of intent to revoke or revise, which will be subject to the provisions of subsection (d) of this section, or elect not to issue such notice. In consideration of whether to revoke or revise the permit, the division may consider the intentional nature or degree of negligence, if any, associated with this spill, and the extent to which containment or cleanup is possible, the nature, number and frequency of previous spills by the permittee and the potential degree of harm to the groundwater and surrounding wells due to such spill.

(d) *Notice.*

- (1) For any revocation or revision of an operating permit containing a special or administrative exemption permitting certain land uses or activities, the division

will issue a notice of intent to revoke or revise the permit, which states that the division intends to revoke or revise both the operating permit and accompanying exemption.

- (2) The written notice of intent to revoke or revise will contain the following information:
 - a. The name and address of the permittee, if any, and property owner, if different.
 - b. A description of the facility which is the subject of the proposed revocation or revision.
 - c. The location of the spill, if any.
 - d. A concise explanation and specific reasons for the proposed revocation or revision.
 - e. A statement that failure to file a petition with the clerk of the Board of County Commissioners within 20 days after the date upon which the permittee receives written notice of the intent to revoke or revise will render the proposed revocation or revision final and in full force and effect.
- (3) Failure of permittee to file a petition as set forth in this subsection will render the proposed revocation or revision final and in full force and effect.

Nothing in this section will preclude or be deemed a condition precedent to the division's seeking a temporary or permanent injunction.

(Ord. No. 89-30, § 1(6.06), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-252. Inspections; enforcement generally.

(a) *Inspections.*

- (1) The county wellfield protection officer and his designated inspectors are hereby authorized and empowered to make inspections at reasonable hours of all land uses or activities regulated by this article including nonresidential buildings, struc-

tures and lands within protection zones in the county, in order to determine if regulations relating to wellfield protection and other applicable county regulations are being followed.

- (2) A condition of every operating permit shall be permission for inspection of the premises by an authorized county wellfield protection officer or inspector.
- (3) Inspections may be made without notice, and refusal to allow such an inspection will be sufficient grounds for revocation of the operating permit issued by the division.
- (4) If a person who has common authority over a building, structure or land does not permit an inspection, such failure of such person to permit an inspection will be sufficient grounds and probable cause for a court of competent jurisdiction to issue an administrative warrant for the purpose of inspecting, surveying or examining the premises.
- (5) If a building, structure or land appears to be vacant or abandoned, and the property owner cannot be readily contacted in order to obtain consent for an inspection, the wellfield protection officer or inspector may enter into or upon any open or unsecured portion of the premises in order to conduct an inspection thereof.
- (6) The wellfield protection officer or inspector will be provided with official identification and will exhibit such identification when making any inspection.
- (7) It will be the duty of all law enforcement officers to assist in making inspections when such assistance is requested by the wellfield protection officer or inspector.

(b) *Remedies.* Whenever the wellfield protection officer or an inspector determines that there is a violation of this article, the officer or inspector will follow the procedures established by the county for bringing a case before the county code enforcement board or any alternative code enforcement body adopted by the county, or will seek injunctive relief as provided in section 14-254. A

notice to cease a land use or activity, a permit or an exemption issued under this article will not relieve the owner or operator of the obligation to comply with any other applicable federal, state, regional or local code, regulation, rule, ordinance or requirement, nor will the notice, permit or exemption relieve any owner or operator of any liability for violation of such codes, regulations, rules, ordinances or requirements.

(Ord. No. 89-30, § 1(5.04), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-253. Responsibility for cleanup of regulated substances; liability for damages.

Any person subject to this article will be liable for any damage caused by a regulated substance present on or emanating from the person's property, for all costs of removal or remedial action incurred by the county, and damages for injury to, destruction of or loss of natural resources, including the reasonable costs of assessing such injury, destruction or loss resulting from the release or threatened release of a regulated substance. Such removal or remedial action by the county may include but is not limited to the prevention of further contamination of groundwater, monitoring, and containment and cleanup or disposal of regulated substances resulting from the spilling, leaking, pumping, pouring, emitting or dumping of any regulated substance or material which creates an emergency hazardous situation or is expected to create an emergency hazardous situation.

(Ord. No. 89-30, § 1(5.04), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-254. Injunctive relief.

If any person who engages in activities regulated by this article stores, handles, uses or produces hazardous or toxic substances regulated under this article, or the regulations promulgated pursuant to this article, without having obtained an operating permit as provided for in this article, or continues to operate in violation of the provisions of this article or the regulations promul-

gated pursuant to this article, then the county may file an action for injunctive relief in a court of competent jurisdiction.

(Ord. No. 89-30, § 1(5.04), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-255. Appeals.

If the division denies an exemption or the applicant disputes any final administrative determination made by the division pursuant to this article, the applicant may file an appeal of the division's written decision in accordance with the procedures set forth for appeals of administrative decisions in section 34-145(a), and in accordance with any county administrative codes adopted to implement the provisions of chapter 34.

(Ord. No. 89-30, § 1(5.06), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-256. Fees.

(a) *Permit fees.* Prior to the issuance, renewal or transfer of a permit or an exemption the applicant must pay a fee as set forth in the applicable county administrative code. Such fee will be used to defray the cost of monitoring the compliance with this article.

(b) *Administrative fees; service charge.*

- (1) The cost of administering and enforcing this article will be borne by the public utilities owning the public potable water wellfields protected by the provisions of this article. Each utility will be assessed its pro rata share of the cost of administering and enforcing this article.
- (2) The county may create municipal service benefit units, as necessary, whereby the county may impose a service charge payable to the county as a pro rata share of the costs of administering and enforcing this article.
- (3) The service charge payment to the county for wellfield environmental protection services may be based upon a stated dollar amount per a set amount of gallons per day of the permitted maximum daily withdrawal rate capacity of the utility evidenced by permits as issued by the South

Florida Water Management District or any other method deemed equitable by the county.

- (4) The service charge payable pursuant to this section must be deposited in a county fund and will be used exclusively by the county and its division of water resources to pay for the costs of the wellfield protection services directed by this article, and no part of such funds will be used for any purpose other than the administering and enforcing of this article.

(Ord. No. 89-30, § 1(8.01), (8.02), 8-23-89; Ord. No. 90-40, § 1, 8-1-90; Ord. No. 90-46, § 2, 9-19-90; Ord. No. 95-01, § 1, 1-4-95)

Sec. 14-257. Disclosure of trade secrets.

The division will not disclose any trade secrets of a permittee under this article that are exempted from such disclosure by federal or state laws; provided, however, the burden will be on the permittee to demonstrate entitlement to such nondisclosures. Decisions by the division as to such entitlement may be appealed as set forth in section 14-255.

(Ord. No. 89-30, § 1(5.05), 8-23-89; Ord. No. 95-01, § 1, 1-4-95)

Secs. 14-258—14-290. Reserved.

ARTICLE IV. WETLANDS PROTECTION*

Sec. 14-291. Applicability.

The provisions of this article apply to the unincorporated areas of Lee County.

(Ord. No. 96-17, § 3, 9-18-96)

Sec. 14-292. Definitions.

[The following words, terms and phrases, when used in this article, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:]

***Editor's note**—Ordinance No. 96-17, § 3, adopted September 18, 1996, repealed §§ 14-291—14-300, 14-331—14-335 and added in lieu thereof §§ 14-291—14-295. Formerly, such sections pertained to similar provisions and derived from Ord. No. 86-31, § 1, 3—15, 10-29-86; Ord. No. 88-33, § 5, 7-20-88; Ord. No. 91-05, § 1, 2, 1-30-91; Ord. No. 93-03, § 1, 1-6-93.

Cross reference—Transfer of development rights, § 2-141 et seq.

*Adopted
January 4th, 1995*

ORDINANCE NO. 95-01

AN ORDINANCE RE-ADOPTING, LEE COUNTY LAND DEVELOPMENT CODE, CHAPTER 14, ARTICLE III, divisions 1 AND 2, PROMULGATED AS ORDINANCE 89-30, AND AMENDED BY ORDINANCES 90-40, 90-46 AND 93-19, AND KNOWN PREVIOUSLY AS THE LEE COUNTY WELLFIELD PROTECTION ORDINANCE; PROVIDING FOR AUTHORITY, INTENT, AND APPLICABILITY; PROVIDING DEFINITIONS; PROVIDING FOR THE ESTABLISHMENT OF WELLFIELD PROTECTION ZONES; PROVIDING FOR GENERAL PROVISIONS; PROVIDING A LIST OF REGULATED TOXIC OR HAZARDOUS SUBSTANCES AND THE GENERAL CHARACTERISTICS OF THOSE SUBSTANCES; PROVIDING PROHIBITED AND REGULATED LAND USES AND ACTIVITIES WITHIN PROTECTION ZONES; PROVIDING FOR EXEMPTIONS; PROVIDING REGULATIONS FOR ABANDONED WELLS; PROVIDING FOR ADMINISTRATION AND ENFORCEMENT; PROVIDING FOR PERMITS; PROVIDING FOR SPECIAL EXCEPTIONS FROM PERMIT REQUIREMENTS; PROVIDING FOR FEES; PROVIDING FOR PENALTIES; PROVIDING SUNSET PROVISIONS; PROVIDING FOR CODIFICATION, INCLUSION IN CODE AND SCRIVENER'S ERRORS, SEVERABILITY AND EFFECTIVE DATE.

WHEREAS, the Board of County Commissioners of Lee County, Florida adopted the Lee County Wellfield Protection Ordinance No. 89-30, as amended, by Ordinance Nos. 90-40, 90-46, and 93-19, in order to protect existing public potable water supply wells from the potentially irreversible and adverse effects of bacterial and chemical contamination from abandoned wells and to control the storage, handling and use of hazardous or toxic substances within certain distances from wellfields; and

WHEREAS, the Wellfield Protection Ordinance has been re-codified and included as part of the Lee County Land Development Code in Article III, division 1, thereof; and

WHEREAS, full implementation of the wellfield protection provisions requires additional time for the Regional Water Supply Authority to coordinate the efforts of both city and county agencies to accomplish the foregoing purposes; and

WHEREAS, the Board of County Commissioners, pursuant to Lee County Comprehensive Plan Objective 41.1 and Policies 41.1-41.3,

is committed to the protection of water resources in Lee County, which includes the potable water supply; and

WHEREAS, the Board of County Commissioners of Lee County, Florida, desires to re-adopt the wellfield protection provisions of the Lee County Land Development Code, so as to insure that the Regional Water Supply Authority has ample opportunity to appropriately coordinate the numerous agencies involved in effectuating the intent and purpose of the Lee County wellfield protection provisions.

NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF LEE COUNTY, FLORIDA, that:

SECTION ONE:

Divisions 1 and 2 of Article III of Chapter 14 of the Lee County Land Development Code are hereby re-promulgated with the underlined text indicating additions to pre-existing text and struck through text indicating deletions, to provide as follows:

ARTICLE III. WELLFIELD PROTECTION

Division 1. GENERALLY

Sec. 14-201. Statutory authority; scope of article.

(a) Pursuant to the authority granted by F.S. ch. 125 and F.S. § 163.3202(2)(c), the standards, rules and regulations set forth in this article have been promulgated and approved by the Board of County Commissioners and apply to all abandoned wells and to certain public utility potable water supply wellfields in the unincorporated area of the county.

(b) The regulations set forth in this article apply to all areas surrounding a wellfield and designated as wellfield protection zones on the adopted protection zone map.

Sec. 14-202. Intent of article.

(a) In order to properly protect certain existing potable water supply wellfields in the unincorporated area of the county, the Board of County Commissioners declares that the storage, handling, use or production of hazardous or toxic substances and the location of abandoned wells in close proximity to public utility potable water supply wells is potentially harmful to the drinking water of the county, and that abandoned wells and certain land uses and activities involving hazardous or toxic substances are hereby prohibited or regulated within certain

- c. The affect of the proposed change on county's industrial employment goal specifically policy 7.1.4.
2. Requests moving lands from a Non-Urban Area to a Future Urban Area
- a. Demonstrate why the proposed change does not constitute Urban Sprawl. Indicators of sprawl may include, but are not limited to: low-intensity, low-density, or single-use development; 'leap-frog' type development; radial, strip, isolated or ribbon pattern type development; a failure to protect or conserve natural resources or agricultural land; limited accessibility; the loss of large amounts of functional open space; and the installation of costly and duplicative infrastructure when opportunities for infill and redevelopment exist.
3. Requests involving lands in critical areas for future water supply must be evaluated based on policy 2.4.2.
4. Requests moving lands from Density Reduction/Groundwater Resource must fully address Policy 2.4.3 of the Lee Plan Future Land Use Element.
- G. Justify the proposed amendment based upon sound planning principles. Be sure to support all conclusions made in this justification with adequate data and analysis.

Item 1: Fee Schedule

Map Amendment Flat Fee	\$500.00 each
Map Amendment > 20 Acres	\$500.00 and \$20.00 per 10 acres up to a maximum of \$2,255.00
Text Amendment Flat Fee	\$1,250.00 each

AFFIDAVIT

I, _____, certify that I am the owner or authorized representative of the property described herein, and that all answers to the questions in this application and any sketches, data, or other supplementary matter attached to and made a part of this application, are honest and true to the best of my knowledge and belief. I also authorize the staff of Lee County Community Development to enter upon the property during normal working hours for the purpose of investigating and evaluating the request made through this application.

Signature of owner or owner-authorized agent

Date

200 2nd Street
P.O. Box 3366
West Palm Beach, Florida
33407
561.659.8031
561.653.2605 fax

CITY OF WEST PALM BEACH COMPREHENSIVE PLAN



Planning, Zoning & Building Department

200 2nd Street
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West Palm Beach, Florida
33407
561.659.8031
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DECEMBER 24, 1999

flats, coral reefs, worm reefs, artificial reefs, offshore springs, nearshore mineral deposits, and offshore sand deposits.

89. "MARINE WETLANDS" means areas with a water regime determined primarily by tides and the dominant vegetation is salt tolerant plant species including those species listed in Subsection 17-4.02(17), Florida Administrative Code, "Submerged Marine Species."

90. "MASS TRANSIT" means passenger services provided by public, private or non-profit entities such as the following surface transit modes: commuter rail, rail rapid transit, light rail transit, light guideway transit, express bus, and local fixed route bus.

91. "MINERALS" means all solid minerals including clay, gravel, phosphate rock, lime, shells (excluding live shellfish), stone, sand, heavy minerals, and any rare earths, which are contained in the soils or waters of the state.

92. "MOBILE HOME" means a structure meeting the definition in s. 320.01, F.S. (1992 Supp.), transportable in one or more sections, which, in the traveling mode, is eight body feet or more in width, and which is built on a metal frame and designed to be used as a dwelling with or without a permanent foundation when connected to the required utilities, and includes the plumbing, heating, air conditioning and electrical systems contained therein. If fabricated after June 15, 1976, each section bears a U.S. Department of Housing and Urban Development label certifying that it is built in compliance with the federal Manufactured Home Construction and Safety Standards.

93. "NATIONAL REGISTER LANDMARK" means a historic property evaluated and found to have significance at the national level and designated as such by the Secretary of the Interior. **[Note: the term "Nat. Register Landmark" is incorrect]

94. "NATIONAL REGISTER OF HISTORIC PLACES" means the official federal list of districts, sites, buildings, structures, and objects significant in American history, architecture, archeology, engineering and culture.

95. "NATURAL DRAINAGE FEATURES" means the naturally occurring features of an area which accommodate the flow of significant amounts of stormwater, such as streams rivers, lakes, sloughs, floodplains and wetlands.

96. "NATURAL DRAINAGE FLOW" means the pattern of surface and stormwater drainage through or from a particular site before the construction or installation of improvements or prior to regrading.

97. "NATURAL GROUNDWATER AQUIFER RECHARGE AREAS" or "NATURAL GROUNDWATER RECHARGE AREAS" or "GROUNDWATER RECHARGE AREAS" means areas contributing to or providing volumes of water which make a contribution to the storage or regional flow of an aquifer.



22488

MANATEE COUNTY GOVERNMENT

PLANNING DEPARTMENT
"TO SERVE WITH EXCELLENCE"

Date: December 11, 2000

To: All Holders of the Comprehensive Plan

From: Florrie Lynch, Administrative Coordinator *FL*
Comprehensive Planning Division

RE: NEW COMPREHENSIVE PLAN

Please find attached the 2020 Manatee County Comprehensive Plan. This plan reflects all text and map changes made to the Comprehensive Plan through December, 1999.

The package is separated into two sections, graphics and text. The graphics portion contains color tabs and maps, which are already collated. The text portion has slip sheets for separation of the elements into the tabbed sections.

If you have any questions, please do not hesitate to call me at 749-3070, ext. 6872.

/fl
attachment

LEE COUNTY
PLANNING DIVISION

Medium Commercial Uses - Commercial establishments, or groupings thereof, which constitute no greater than 150,000 square feet of gross building square footage, are limited to a maximum Floor Area Ratio of 0.23 and are generally limited to neighborhood retail uses (as defined herein). These uses may also include office uses for professional or personal services, where such uses are consistent with Objective 2.6.4 of the Future Land Use Element and with other development standards for commercial uses within residential designations described under Goal 2.10.

Minerals - All solid minerals which are contained in soil or water, including clay, gravel, phosphate rock, lime, shells (excluding live shellfish), stone, sand, heavy minerals, and any rare earths.

Mixed or Multiple Use - The mixture of more than one land use within a single building, or within a single project in separate buildings, with such uses planned in a coordinated manner under a single master development plan. Land uses, which when combined constitute mixed or multiple uses, exclude parks, golf courses, schools, and public facilities (fire stations, utility substations, etc.). Land uses, which when combined within a single project constitute mixed or multiple uses include residential, commercial, industrial uses.

Moderate-Income Affordable Housing - Dwelling units which are sold or based for an amount which may be considered within reasonable reach of a moderate-income household. Value/cost of such units shall be calculated based upon an approved methodology.

Moderate-Income Household - One or more persons or a family, the total annual adjusted gross household income of which is less than 120 percent of the median annual adjusted gross income for households within Manatee County.

Myakka City - A rural unincorporated community in southeast Manatee County within the area described as follows: Beginning at a point which is the southeast corner of Section 13, Range 21, Township 36, then west along the south section line of said Section 13 to the southeast corner of Section 14, then west 1/3 (one-third) mile along the south section line of said Section 14, then north along a line parallel to the east section line of Section 14 to the north section line of Section 14, said north section line of Section 14 being also the south section line of Section 11, then continue north 1/2 (one-half) mile along a line parallel to the east section line of Section 11, then east 1/3 (one-third) mile along the east-west half section line of Section 11 to the east section line of Section 11, said east section line being also the west section line of Section 12, then east one mile along the east-west half section line of Section 12 to the east section line of Section 12, then south 1/2 (one-half) mile along the east section line of said Section 12 to the northeast corner of Section 13, then south one mile along the east section line of said Section 13 to the southeast corner of Section 13, the point of beginning.

National Ambient Air Quality Standards (NAAQS) - Restrictions established by the Environmental Protection Agency pursuant to Section 109 of the Clean Air Act to limit the

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Comprehensive Plan 1997

Broward
County
Florida

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Support Documents

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Intensity - An objective measurement of the extent to which land may be developed or used, including the consumption or use of space above, on or below ground; the measurement of the use of or demand on natural resources; and the measurement of the use of and demand on facilities and services.

Interagency hazard mitigation report - The recommendations of a team of federal, state, regional, or local officials which address measures to reduce the potential for future flood losses and which is prepared in response to a Presidential Disaster Declaration.

Level of service - An indicator of the extent or degree of service provided by, or proposed to be provided by a facility based upon and related to the operational characteristics of the facility. Level of service shall indicate the capacity per unit of demand for each public facility.

Level of service standard - The design capacity of a facility.

Mass transit - Passenger services provided by public, private or non-profit entities such as the following surface transit modes: commuter rail, rail rapid transit, light rail transit, light guideway transit, express bus, and local fixed route bus.

Minerals - All solid minerals, including clay, gravel, phosphate rock, lime, shells (excluding live shellfish), stone, sand, heavy metals, and any rare earths, which are contained in the soils or waters of the state.

Nonpoint source pollution - A form of water, soil, or air pollution which is diffuse in its origin and frequently widespread in its occurrence. These contaminants are typically dissolved in stormwater run-off, adhered to soil particles, or suspended in air.

Objective - A specific, measurable, intermediate end that is achievable and marks progress toward a goal.

Open spaces - Undeveloped lands suitable for passive recreation or conservation uses.

Pattern - The form of the physical dispersal of development or land use.

Policy - The way in which programs and activities are conducted to achieve an identified goal.

Redevelopment - See urban redevelopment.

Slough - The valleys spanning the Atlantic Coastal Ridge in an east-west direction which historically, provided natural mechanisms by which water drained from the Everglades.

q. *Conservation.* Lands designated Conservation are intended to protect major reserve water supply areas and natural reservations.

r. *Agriculture.* Lands designated agriculture are intended to maintain and foster agriculture, ornamental horticulture, aquaculture, forestry, the equestrian industry, and related industries. A study of agriculture completed by the Broward County Planning Council in 1996 indicated a significant portion of the land having a future land use designation of agriculture has been identified by the SFWMD as part of the East Coast Buffer Plan. As this land is acquired by the SFWMD, plan amendments will be initiated to change the land's future land use designation to Conservation. Another significant finding in the study report is a discrepancy between land having a future land use classification of Agriculture and those lands actually in agricultural production. Consequently, an ample proportion of Agriculture future land uses are being utilized as areas to retard or delay urban development until such time as it becomes feasible. It is anticipated a future land use plan amendment will resolve the discrepancy between existing and future agricultural uses.

s. *Community Facilities.* Lands designated Community Facilities are intended to provide for a full range of regional and community uses such as educational, medical, religious, civic, cultural, judicial, and correctional facilities.

t. *Transportation.* Lands designated Transportation are intended to provide for the full range of transportation uses, such as transportation corridors, major transportation facilities such as expressways, interchanges, public and private airports and landing strips, ports, and railroad facilities.

u. *Utilities.* Lands designated Utilities are intended to provide for the full range of utility uses such as water and wastewater treatment plants, solid waste transfer stations and facilities, and electrical transmission facilities, towers, sub-stations, and power plants.

v. *Mining.* Lands designated for mining are intended to provide for the removal of minerals from their site solely for commercial purposes, which may include crushing, batching, mixing, and forming of mined materials. Mining operations should be compatible with existing surrounding and future land uses.

Miller indices

Miller indices (mil'-ler) A set of three or four symbols (letters or integers) used to define the orientation of a crystal face or internal crystal plane. The indices are determined by expressing, in terms of lattice constants, the reciprocals of the intercepts of the face or plane on the 3 crystallographic axes, and reducing (clearing fractions) if necessary to the lowest integers retaining the same ratio. When the exact intercepts are unknown, the general symbol (*hkl*) is used for the indices, where *h*, *k*, and *l* are respectively the reciprocals of rational but undefined intercepts along the *a*, *b*, and *c* crystallographic axes. In the hexagonal system, the Miller indices are (*hkl*); these are known as the *Miller-Bravais indices*. Indices designating individual crystal faces are enclosed in parentheses; complete crystal forms, in braces; crystal zones, in square brackets; and crystallographic lines, in greater-than/less-than symbols. To denote the interception at the negative end of an axis, a line is placed over the appropriate index, as ($\bar{1}\bar{1}1$). The indices were proposed by William H. Miller (1801-1880), English mineralogist. See also: *indices of lattice row*. Syn: *crystal indices*; *hkl indices*.

millerite (mil'-ler-ite) A brass-yellow to bronze-yellow rhombohedral mineral: NiS. It usually has traces of cobalt, copper, and iron, and is often tarnished. Millerite generally occurs in fine hairlike or capillary crystals of extreme delicacy, chiefly as nodules in clay ironstone. Syn: *capillary pyrites*; *nickel pyrites*; *hair pyrites*.

millet-seed sand (mil'-let-seed) Sand that consists essentially of smoothly and conspicuously rounded grains about the size of a millet seed; specif. a desert sand whose grains have a surface like that of ground glass and are very perfectly rounded as a result of wind action that caused them to be constantly impacting against each other.

mill-hole mining *glory-hole mining*.

millidarcy (mil'-li-dar'-cy) The customary unit of measurement of fluid permeability, equivalent to 0.001 *darcy*. Abbrev: md.

milligal (mil'-li-gal) A unit of acceleration used with gravity measurements; 10^{-3} gal = 10^{-5} m/sec². Abbrev: mGal.

milling ore (mill'-ing) *second-class ore*.

millionth-scale map of the world (mil'-lionth-scale) *International Map of the World*.

millisite (mil'-lis-ite) A white mineral: $(\text{Na},\text{K})\text{CaAl}_6(\text{PO}_4)_4(\text{OH})_9 \cdot 3\text{H}_2\text{O}$.

mill ore Var. of *milling ore*.

millosevichite (mil-lo-sev'-i-chite) A mineral: $(\text{Al},\text{Fe})_2(\text{SO}_4)_3$.

mill-rock (a) A type of coarse acidic pyroclastic breccia found in or close to the volcanic units in which Canadian massive sulfide ore deposits occur (Sangster, 1972, p. 3). (b) More generally, any proximal, typically explosive rhyolite pyroclastic breccia.

millstone (mill'-stone) A *buhrstone*; e.g. a coarse-grained sandstone or a fine-grained quartz conglomerate. Also, one of two thick disks of such material formerly used for grinding grain and other materials, which were fed through a center hole in the upper stone.

millstone grit Any hard, siliceous rock suitable for use as a material for millstones; specif. the Millstone Grit of the British Carboniferous, a coarse conglomeratic sandstone.

Mima mound (Mi'-ma [my'-ma]) A term used in the NW U.S. for one of numerous low, circular or oval domes composed of loose, unstratified, gravelly silt and soil material, built upon glacial outwash on a *hog-wallow* landscape; the basal diameter varies from 3 m to more than 30 m, and the height from 30 cm to about 2 m. The mounds are probably built by pocket gophers (Arkley & Brown, 1954). Named after the Mima Prairie in western Washington State. Cf: *pimple mound*. Also spelled: *mima mound*.

mimetene (mim'-e-tene) *mimetite*.

mimetesite (mi-met'-e-site) *mimetite*.

mimetic [cryst] (mi-met'-ic) Pertaining to a twinned or malformed crystal that appears to have a higher grade of symmetry than it actually does.

mimetic [evol] Said of an organism that exhibits or is characterized by *mimicry*.

mimetic [struc petro] Said of a tectonite whose deformation fabric, formed by recrystallization or neomineralization, reflects and is influenced by pre-existing anisotropic structure; also, said of the fabric itself.

mimetic crystallization Recrystallization and/or neomineralization in metamorphism that reproduces any pre-existent anisotropy, bedding, schistosity, or other structures (Knopf and Ingerson, 1938). Syn: *facsimile crystallization*.

mimetite (mim'-e-tite) A yellow to yellowish-brown mineral of the

apatite group: $\text{Pb}_5(\text{AsO}_4)_3\text{Cl}$. It is isomorphous with pyromorphite and commonly contains some calcium or phosphate. Mimetite usually occurs in the oxidized zone of lead veins, and is a source of lead. Syn: *mimetene*; *mimetesite*.

mimicry (mim'-ic-ry) The superficial similarity that exists between organisms, or between an organism and its surroundings, as a means of concealment, protection, or other advantage. Syn: *mimetic*.

mimosite (mi'-mo-site) A dark-colored *dolerite* containing abundant augite and ilmenite. Cf: *soggedalite*. Obsolete.

minable (min'-a-ble) Said of a mineral deposit for which extraction is technically feasible and economically worthwhile.

minal (min'-al) *end member*.

minasragrite (mi-nas-rag'-rite) A blue efflorescent mineral: $\text{VO}(\text{SO}_4) \cdot 5\text{H}_2\text{O}$.

Mindel (Min'-del) (a) European stage: Pleistocene (above *Glacis*, below *Riss*). (b) The second classical glacial stage of the Pleistocene Epoch in the Alps, after the Günz-Mindel interglacial stage. See also: *Kansan*; *Elster*. —Etymol: Mindel River, Bavaria. Adj: *Mindelian*.

Mindel-Riss The term applied in the Alps to the second classical interglacial stage of the Pleistocene Epoch, after the Mindel glacial stage and before the Riss. See also: *Yarmouth*.

mine n. (a) An underground excavation for the extraction of mineral deposits, in contrast to surficial excavations such as quarries. The term is also applied to various types of open-pit workings. (b) The area or property of a mineral deposit that is being excavated, a mining claim.—v. To excavate for and extract mineral deposits or building stone.

mineragraphy (min-er-ag'-ra-phy) An obsolescent syn. of *ore microscopy*.

mineral (min'-er-al) (a) A naturally occurring inorganic element or compound having an orderly internal structure and characteristic chemical composition, crystal form, and physical properties. Those who include the requirement of crystalline form in the definition would consider an amorphous compound such as opal to be a *mineraloid*. (b) Any naturally formed inorganic material, i.e. a member of the mineral kingdom as opposed to the plant and animal kingdoms.

mineral aggregate An *aggregate* or assemblage of more than one crystal grain (which may be of one or several mineral species) and containing more than one crystal lattice. It can occur as sediment if loosely bound, or as rock if tightly bound.

mineral assemblage (a) The minerals that compose a rock, esp. an igneous or metamorphic rock. The term includes the different kinds and relative abundances of minerals, but excludes the texture and fabric of the rock. See also: *metamorphic assemblage*. (b) *mineral association*.

mineral association A group of minerals found together in a rock, esp. in a sedimentary rock. Syn: *mineral assemblage*.

mineral belt An elongated region of mineralization; an area containing several mineral deposits.

mineral blossom drusy quartz.

mineral caoutchouc *elaterite*.

mineral charcoal *fusain*.

mineral deposit A mass of naturally occurring mineral material, e.g. metal ores or nonmetallic minerals, usually of economic value, without regard to mode of origin. Accumulations of coal and petroleum may or may not be included; usage should be defined in context. Cf: *mineral occurrence*.

mineral disintegration *granular disintegration*.

mineral facies (a) An approx. syn. of *metamorphic facies*. (b) Rocks of any origin whose constituents have been formed within the limits of a certain pressure-temperature range characterized by the stability of certain index minerals.

mineral filler A finely pulverized inert mineral or rock that is included in a manufactured product, e.g. paper, rubber, and plastics, to impart certain useful properties, such as hardness, smoothness, or strength. Common mineral fillers include asbestos, kaolin, and talc.

mineralization [ore dep] (min'-er-al-i-za'-tion) The process or processes by which a mineral or minerals are introduced into a rock, resulting in a valuable or potentially valuable deposit. It is a general term, incorporating various types, e.g. fissure filling, impregnation, replacement.

mineralization [paleont] A process of fossilization whereby the organic components of an organism are replaced by inorganic ("mineral") material.

lightning stone

rock, having a specific gravity lower than a standard (usually 2.85); e.g. quartz, feldspar, calcite, dolomite, muscovite, feldspathoids. Cf. *heavy mineral*. (b) A *light-colored* mineral.

lightning stone (light'-ning) *fulgurite*.

lightning tube A tubular *fulgurite*.

light oil Crude oil that has a high API gravity or Baumé gravity. Cf. *heavy oil*.

light red silver ore *proustite*.

light ruby silver *proustite*.

lightweight aggregate (light'-weight) An aggregate with a relatively low specific gravity, e.g. pumice, volcanic cinders, expanded shale, foamed slag, or expanded perlite or vermiculite.

lightweight concrete A concrete made with *lightweight aggregate*.

lignilite (lig'-ni-lite) Obsolete syn. of *stylolite*.

lignin (lig'-nin) A complex amorphous polysaccharide containing methoxyl and phenyl propane units, always occurring with cellulose and forming an important chemical constituent of wood (Treiber, 1957, p. 446).

lignite (lig'-nite) A brownish-black coal that is intermediate in coalification between peat and subbituminous coal; consolidated coal with a calorific value less than 8300 BTU/lb, on a moist, mineral-matter-free basis. Cf. *brown coal*; *lignite A*; *lignite B*.

lignite A *Lignite* that contains 6,300 or more BTU/lb but less than 8,300 BTU/lb (moist, mineral-matter-free). Cf. *lignite B*. Syn: *black lignite*.

lignite B *Lignite* that contains less than 6,300 BTU/lb (moist, mineral-matter-free); essentially synonymous with *brown lignite* or *brown coal*.

ligule (lig'-ule) A term used for various straplike plant structures, e.g. a membranous structure internal to the leaf base in the heterosporous lycopsids *Isoetes*, *Selaginella*, and *Lepidodendron*; or the limb of the ray flowerlets in a member of the family Compositae.

ligurite (lig'-u-rite) An apple-green variety of sphene.

likasite (lik'-a-site) A sky-blue orthorhombic mineral: $\text{Cu}_3\text{P}_2\text{H}_3(\text{NO}_3)(\text{OH})_2 \cdot \text{H}_2\text{O}$.

likely (like'-ly) Said of a rock, lode, or belt of ground that gives indications of containing valuable minerals. Syn: *kindly*. Ant: *unhappy*.

LIL An acronym for large ion lithophile elements, such as potassium, rubidium, and uranium, which have large ionic radii. First coined to describe the composition of lunar samples (Taylor, 1975).

lilianite (lil'-ian-ite') A steel-gray mineral: $\text{Pb}_3\text{Bi}_2\text{S}_6$.

lily pad (lil'-y) *shellstone*.

lily pad ice A term used for *pancake ice* consisting of circular pieces of ice that are not more than about 50 cm in diameter. Rarely used.

liman (li'-man) (a) A shallow muddy lagoon, bay, or marshy lake, formed at the mouth of a river behind the seaward deposits of a delta and protected by a barrier or a spit; an *estuary* or broad freshwater bay of the sea. Etymol: Russian, from Greek *limen*, "harbor". (b) An area of mud or slime deposited near the mouth of a river.

liman coast A coast with many lagoons (*limans*) and drowned valleys, protected from the open sea by a barrier or a spit; e.g. the northern coast of the Black Sea.

limb [astron] The outer edge of a lunar or planetary disk.

limb [fold] That area of a fold between adjacent fold hinges. It generally has a greater radius of curvature than the hinge region and may be planar. Syn: *flank*. Obsolete syn: *shank*.

limb [polyn] *equatorial limb*.

limb [curve] (a) The graduated margin of an arc or circle in an instrument for measuring angles, such as the part of a marine sextant carrying the altitude scale. (b) The graduated staff of a leveling rod.

limbate (lim'-bate) Having a thickened border or edge of a foraminiferal chamber, commonly at the suture but sometimes elevated.

limb darkening A photometric function of the Moon in which, at the center of the disk is much brighter than the limbs, probably because of the Moon's roughness at optical dimensions.

limburgite (lim'-burg-ite) A dark-colored, porphyritic extrusive igneous rock having olivine and clinopyroxene as phenocryst minerals in an alkali-rich glassy groundmass that may have microlites of pyroxene, olivine, and opaque oxides; some nepheline and/or feldspar may be present, and feldspars are typically absent. Its name, given by Rosenbusch in 1872, is derived from Limburg,

Kaiserstuhl, Germany. Partial syn: *magma basalt*. Not recommended usage.

limbus (lim'-bus) A crease at the edge of the vesicle of a vesiculate pollen grain, or at the edge of the pseudosaccus of a pseudosaccate grain, in which the proximal and distal exine layers are more or less fused.

lime (a) Calcium oxide, CaO ; specif. quicklime and hydraulic lime. The term is used loosely for calcium hydroxide (as in *hydrated lime*) and incorrectly for calcium carbonate (as in *agricultural lime*). (b) A cubic mineral: CaO . (c) A term commonly misused for calcium in such deplorable expressions as "carbonate of lime" or "lime feldspar". (d) A limestone. The term is sometimes used by drillers for any rock consisting predominantly of calcium carbonate.

limeclast (lime'-clast) A lithoclast derived by erosion from an older limestone; also, an intraclast disrupted from partly consolidated calcareous mud on the bottom of a sea or lake.

lime concretion A concretion in soil, having a variable shape and size and consisting of an aggregate of precipitated calcium carbonate or of other material cemented by it.

lime feldspar A misnomer for *calcium feldspar*.

lime mica *margarite* [mineral].

lime mud The unconsolidated micritic component of a limestone.

lime mudstone A term proposed by Dunham (1962) for a fairly pure (93-99% calcium carbonate), mainly nonporous and impermeable, texturally uniform limestone whose main constituent (75-85%) is calcite mud (micrite). See also: *micritic limestone*.

lime olivine *calcio-olivine*.

lime pan [geomorph] A playa with a smooth, hard surface of calcium carbonate, commonly tufa.

lime pan [soil] A type of *hardpan* cemented chiefly with calcium carbonate. Also spelled: *limepan*.

lime rock A term used in SE U.S. (esp. Florida and Georgia) for an unconsolidated or partly consolidated form of limestone, usually containing shells or shell fragments, with a varying percentage of silica. It hardens on exposure and is sometimes used as *road metal*. Also spelled: *limerock*.

lime-silicate rock (lime-sil'-i-cate) *calc-silicate rock*.

lime-soda feldspar (lime-so'-da) A misnomer for *sodium-calcium feldspar*.

limestone (lime'-stone) (a) A sedimentary rock consisting chiefly (more than 50% by weight or by areal percentages under the microscope) of calcium carbonate, primarily in the form of the mineral calcite, and with or without magnesium carbonate; specif. a carbonate sedimentary rock containing more than 95% calcite and less than 5% dolomite. Common minor constituents include silica (chalcedony), feldspar, clays, pyrite, and siderite. Limestones are formed by either organic or inorganic processes, and may be detrital, chemical, oolitic, earthy, crystalline, or recrystallized; many are highly fossiliferous and clearly represent ancient shell banks or coral reefs. Limestones include chalk, calcarenite, coquina, and travertine, and they effervesce freely with any common acid. Abbrev: ls. (b) A general term used commercially (in the manufacture of lime) for a class of rocks containing at least 80% of the carbonates of calcium or magnesium and which, when calcined, gives a product that slakes upon the addition of water.

limestone buildup *carbonate buildup*.

limestone log An obsolete *resistivity log* device of short *lateral log* type that used 5 electrodes.

limestone pavement (a) A limestone bedding-plane or glaciated surface in a karst area that is divided into *clints* by *solution fissures*. See also: *crevice karst*. (b) A solution-grooved surface on limestone. See also: *karrenfeld*.

lime uranite *autunite*.

limewater (lime'-wa-ter) Natural water with large amounts of dissolved calcium bicarbonate or calcium sulfate.

limiting beds (lim'-it-ing) The oldest strata immediately above and the youngest strata immediately below an angular unconformity; they are used to date the folding and erosion (Spieker, 1956).

limnal (lim'-nal) Pertaining to a body or bodies of fresh water, esp. to a lake or lakes.

limnetic (lim-net'-ic) (a) Relating to the pelagic or open part of a body of fresh water. (b) Said of lake-dwelling organisms and communities that are free from direct dependence on the bottom or shore.—Syn: *limnic* [lake].

limnic [coal] (lim'-nic) (a) Said of coal deposits formed inland in freshwater basins, peat bogs, or swamps, as opposed to *paralic* coal

orbitolinid

orbitolite

orbitolite (or-bit'-o-lite) Any foraminifer belonging to the genus *Orbitolites* of the suborder Miliolina, characterized by a discoidal test containing numerous small chambers in annular series. Range, Upper Paleocene to Eocene.

orcelite (or-cel'-ite) A mineral: $\text{Ni}_{15}\text{As}_2$.

ordanchite (or-danch'-ite) An extrusive rock containing phenocrysts of sodic plagioclase, hauyne, hornblende, augite, and some olivine; an olivine-bearing hauyne *trachyandesite*. Named by Lacroix in 1917 for Banne d'Ordanche, Auvergne, France. Not recommended usage.

order [geomorph] (or'-der) (a) *stream order*. (b) *basin order*.

order [petrology] In the CIPW classification of igneous rocks, the basic unit of the *class [petrology]*.

order [taxon] A category in the hierarchy of classification of plants and animals intermediate between *class* and *family*. In botany, the name of an order characteristically ends in -ales; e.g. *Filicales*. Cf. *suborder*.

order-disorder inversion (or'-der-dis'-or-der) *substitutional transformation*.

order-disorder polymorphs Two crystal substances of the same composition but of different atomic arrangement. In the higher-temperature or disordered form, two or more elements are randomly distributed over a particular set of atom sites; in the lower-temperature or ordered form, the atoms become ordered with respect to the same sites. The ordered form usually has lower symmetry.

order-disorder transformation A *transformation [cryst]* between two polymorphic forms, one of which has a more ordered structure than the other. In general, if the ordered, low-symmetry, low-temperature form is heated, a point is reached at which some portion of the structure becomes disordered, or random, usually with an increase in crystal symmetry, to produce the high-temperature form. Cf. *substitutional transformation*; *lambda transformation*.

order in minerals The ordered substitution of one ion for another in the crystal structure, e.g. in microcline, in which one fourth of the Si positions are occupied by Al. Cf. *disorder in minerals*. See also: *short-range order*; *long-range order*.

order of crystallization The apparent chronologic sequence in which crystallization of the various minerals of an assemblage takes place, as evidenced mainly by textural features. Syn: *sequence of crystallization*.

ordinary chert (or'-di-nar'-y) A generally homogeneous *smooth chert*. It has an even fracture surface, is nearly opaque, has slight granularity or crystallinity, and may be of any color (chiefly white, gray, or brown, or sometimes mottled) (Ireland et al., 1947, p. 1486).

ordinary coccolith One of the unmodified coccoliths in a *coccolithophore* exhibiting dimorphism.

ordinary lead *common lead*.

ordinary ray *O ray*.

ordinary tide level *mean tide level*.

ordnance datum (ord'-nance) A name given to several horizontal datums to which heights have been referred on official maps of the British Ordnance Survey; specif. in Great Britain (but not Ireland) the mean sea level at Newlyn in Cornwall. Abbrev: OD.

ordosite (or-don'-ez-ite) A brown tetragonal mineral: ZnSb_2O_6 . Also spelled: *ordoñezite*.

ordosite (or'-do-site) A dark-colored *syenite*, containing about 60 percent sodic clinopyroxene. The name, given by Lacroix in 1925, is for the Ordos Plateau, China. Obsolete.

Ordovician (Or-do-vi'-cian) The second earliest period of the *Phanerozoic era* (after the Cambrian and before the Silurian), thought to have covered the span of time between 500 and 440 million years ago; also, the corresponding system of rocks. It is named after a Celtic tribe called the Ordovices. In the older literature the Ordovician is sometimes known as the *Lower Silurian*. The age of *marine invertebrates*. Obsolete syn: *Champlainian*.

The naturally occurring material from which a mineral or ore of economic value can be extracted at a reasonable profit. The mineral(s) thus extracted. The term is generally but not always used to refer to metalliferous material, and is often modified by the name of the valuable constituent, e.g., "iron ore". See *mineral deposit*; *orebody*; *ore mineral*. (b) The term "ores" is also applied collectively to opaque accessory minerals, such as *pyrite* and *magnetite*, in igneous rocks. (c) The term "ores" is also applied to metal-rich layers in a sequence of sedimentary rocks.

organic rock

ore block A section of an orebody, usually rectangular, that is used for estimates of overall tonnage and quality. See also: *blocking out*.

ore blocked out *developed reserves*.

orebody (ore'-bod-y) A continuous, well-defined mass of material of sufficient ore content to make extraction economically feasible. See also: *mineral deposit*.

ore channel A little-used term for the orebody or lode, including both gangue and economically valuable minerals. See also: *lode-stuff*. Syn: *lode country*.

ore chimney pipe [*ore dep*].

ore cluster A genetically related group of orebodies that may have a common root or source rock but that may differ structurally or otherwise.

ore control Any tectonic, lithologic, or geochemical feature considered to have influenced the formation and localization of ore. Cf. *metallotect*.

ore-forming fluid (ore'-form-ing) *mineralizer*.

oregonite (or'-e-gon-ite') A hexagonal mineral: Ni_2FeAs_2 .

ore guide Any natural feature, such as alteration products, geochemical variations, local structures, or plant growth, known to be indicative of an orebody or mineral occurrence. See also: *lithologic guide*; *stratigraphic guide*.

ore in sight *developed reserves*.

Orellan (O-rel'-lan) North American continental stage: Middle Oligocene (above Chadronian, below Whitnean).

ore magma A term proposed by Spurr (1923) for a magma that may crystallize into an ore; the sulfide, oxide, or other metallic facies of a solidified magma.

ore microscopy The study of opaque ore minerals in polished section with a reflected-light microscope. Syn: *mineragraphy*; *mineralography*.

ore mineral The part of an ore, usually metallic, which is economically desirable, as contrasted with the *gangue*.

Orenburgian (O'-ren-burg'-i-an) Stage in Russia: uppermost Upper Carboniferous (above Gzhelian, below Permian Asselian).

orendite (o-ren'-dite) A porphyritic leucite *lamproite* containing phlogopite phenocrysts in a nepheline-free reddish-gray groundmass of leucite, sanidine, phlogopite, amphibole, and diopside; a phlogopite-leucite *trachyte*. Its name, given by Cross in 1897, is derived from Orenda Butte, Leucite Hills, Wyoming. Not recommended usage.

ore of sedimentation *placer*.

oreography (ore-og'-ra-phy) *orography*.

ore pipe *pipe [ore dep]*.

ore roll *roll orebody*.

ore shoot An elongate pipelike, ribbonlike, or chimneylike mass of ore within a deposit (usually a vein), representing the more valuable part of the deposit. Syn: *shoot [ore dep]*.

organ genus (or'-gan) A genus name used for groups of fossil plants that are assignable to a family with minimal distinction from genera of plants as normally considered.

organic (or-gan'-ic) adj. Pertaining or relating to a compound containing carbon, especially as an essential component. Organic compounds usually have hydrogen bonded to the carbon atom. Cf. *inorganic*. —n. A substance containing carbon, as in such expressions as "organic-rich shale".

organic bank *bank [sed]*.

organic evolution *evolution*.

organic geochemistry That branch of chemistry concerned with naturally occurring carbonaceous and biologically derived substances of geological interest.

organic hieroglyph *bioglyph*.

organic lattice *growth lattice*.

organic mound *bioherm*.

organic reef A *bioherm* of sufficient size to develop associated facies. It is erected by, and composed mostly of the remains of, sedentary or colonial and sediment-binding organisms, generally marine: chiefly corals and algae, less commonly crinoids, bryozoans, sponges, mollusks, and other forms that live their mature lives near but below the surface of the water (although they may have some exposure at low tide). Their exoskeletal hard parts remain in place after death, and the deposit is firm enough to resist wave erosion. An organic reef may also contain still-living organisms. See also: *coral reef*; *algal reef*. Cf. *bank [sed]*.

organic rock A sedimentary rock consisting primarily of the remains of organisms (plant or animal), such as of material that originally formed part of the skeleton or tissues of an animal. Cf.

inlier

- waterway entering a sea, lake, or river; a creek; an inflowing stream. (c) A short, narrow waterway between islands, or connecting a bay, lagoon, or similar body of water with a larger body of water, such as a sea or lake; e.g. a waterway through a coastal obstruction (such as a reef or a barrier island) leading to a bay or lagoon. Syn: *tongue*. (d) *tidal inlet*.
- inlier** (in'-li-er) An area or group of rocks surrounded by rocks of younger age, e.g. an eroded anticlinal crest. Cf: *outlier*.
- in-line offset** The component of the distance from a geophone to the shotpoint in the direction of the line of the spread. Cf: *perpendicular offset*.
- innate** (in'-nate') Said of certain igneous rocks that have undergone transformation without intrusion or other change of position, such as rocks formed by simple fusion in place (Medlicott & Blanford, 1879, p. 752).
- innelite** (in'-ne-lite) A mineral: $\text{Na}_2(\text{Ba}, \text{K})_4(\text{Ca}, \text{Mg}, \text{Fe})\text{Ti}_3\text{Si}_4\text{O}_{18}(\text{OH}, \text{F})_{1.5}(\text{SO}_4)$.
- inner bar** (in'-ner) A bar formed at the upper bend of a flood channel, or where the waters of a river are checked by a flood tide. Ant: *outer bar*.
- inner beach** The part of a sandy beach that is covered by the wash of gentle waves and is ordinarily saturated. Cf: *foreshore*.
- inner core** The central part of the Earth's core, extending from a depth of about 5100 km to the center (6371 km) of the Earth; its radius is about one third of the whole core. The inner core is probably solid, as evidenced by the observation of S waves that are propagated in it, and because compressional waves travel noticeably faster through it than through the outer core. Density ranges from 10.5 to 15.5 g/cm³. It is equivalent to the G layer. Cf: *outer core*. Partial syn: *lower core*. Syn: *siderosphere*.
- inner hinge plate** Either of a pair of subhorizontal *hinge plates* in the cardinalia of some brachiopods (such as rhynchonellids, spiriferoids, and terebratuloids), located median of the crural bases and fused laterally with them. Cf: *outer hinge plate*.
- inner lamella** The thin layer covering an ostracode body in the anterior, ventral, and posterior parts of the carapace, chitinous except for calcified marginal parts forming the duplicature (TIP, 1961, pt. Q, p. 51). Cf: *outer lamella*.
- inner lamina** The inner shell layer of a compartmental plate of certain cirripede crustaceans, separated from an outer lamina by parietal tubes.
- inner lead** An area of calm water between a line of parallel offshore islands (such as a string of *skerries*) and the mainland.
- inner lip** The adaxial (inner) margin of the aperture of a gastropod shell, extending from the foot of the columella to the suture. It consists of the *columellar lip* and the *parietal lip*. Cf: *outer lip*.
- inner lowland** The innermost of the lowland belts of a *belted coastal plain*, formed in less-resistant rocks that separate the oldland from the cuesta landscape (the first cuesta scarp descending to the bottom of the lowland). Syn: *inner vale*.
- inner mantle** *lower mantle*.
- inner plate** One of a pair of subvertical plates in the cardinalia of some pentameracean brachiopods, lying on the ventral side of the base of the brachial process and fused dorsally with it. Cf: *outer plate*.
- inner reef** One of the reefs comprising the landward or shelfward part of a *reef complex* or *reef tract*. These are often smaller and less developed than *outer reefs* in the same region. Cf: *leeward reef*; *windward reef*.
- inner-shelf shoal** An arcuate and linear shelf sand body such as occurs on the U. S. inner continental shelf, which is formed by nearshore processes (Swift et al., 1972, Ch. 23).
- inner side** The portion of a conodont element on the concave side of the anterior-posterior midline. Ant: *outer side*.
- inner space** The region involved in marine research; the ocean or the ocean environment. Cf: *outer space*. Syn: *hydrospace*.
- inner vale** *inner lowland*.
- inner vesicle** A membranous expansion from the distal part of a maternal zooid in some cheilostome bryozoans, which partly fills the opening of a brood chamber (Ryland, 1970, p. 96).
- inner wall** The innermost wall in double-walled archaeocyathids, surrounding the central cavity (TIP, 1972, pt. E, p. 19-20).
- inninmorite** (in-nin-mor'-ite) An igneous rock composed of augite and plagioclase (anorthite to labradorite) in a groundmass of sodic plagioclase, augite, and abundant glass. It is similar in composition to *cumbraite*. The name is for Inninmore, Scotland. Not recommended usage.
- inoperculate** (in-o-per'-cu-late) adj. Having no operculum; e.g.

inshore

- said of an irregular tear that serves as the opening of a *stromatolite* through which spores are discharged.—n. An *inoperculate* animal or shell; e.g. an *inoperculate* gastropod shell.
- inorganic** (in-or-gan'-ic) Pertaining or relating to a compound that contains no carbon. Cf: *organic*.
- inoculation** (in-os'-cu-la'-tion) The union of tributaries to a main stream.
- inosilicate** (in-o-sil'-i-cate) A class or structural type of silicate characterized by the linkage of the SiO_4 tetrahedra into chains by the sharing of oxygens. In a simple chain, e.g. *pyroxene*, two oxygens are shared; in a double chain or band, e.g. *amphibole*, half the SiO_4 tetrahedra share three oxygens and the other half share two. The Si:O ratio of the former type is 1:3 and for the latter it is 4:11. Cf: *nesosilicate*; *sorosilicate*; *cyclosilicate*; *phyllosilicate*. Syn: *chain silicate*.
- in-place assemblage** *fossil community*.
- input well** (in'-put) *injection well*.
- inquilinum** (in'-qui-lin-ism') A form of *commensalism* in which one organism lives inside another, usually in the digestive tract or respiratory chamber. Adj: *inquiline*. Cf: *parasitism*.
- in regime** Said of a stream or channel that has attained an average equilibrium or that is capable of adjusting its cross-sectional form or longitudinal profile by means of alterations imposed by the flow, and in which the average values of the quantities that constitute regime show no definite trend over a period of years (such as 10-20 years). Cf: *graded [geomorph]*.
- inselberg** (in'-sel-berg) A prominent isolated residual knob, hill, or small mountain of *circumdenudation*, usually smoothed and rounded, rising abruptly from and surrounded by an extensive lowland erosion surface in a hot, dry region (as in the deserts of southern Africa or Arabia), generally bare and rocky although partly buried by the debris derived from and overlapping its slopes; it is characteristic of an arid or semiarid landscape in a late stage of the erosion cycle. The term was originated by W. Bornhardt. Etymol: German *Inselberg*, "island mountain". Pl: *inselbergs*; *inselberge*. Cf: *monadnock*; *bornhardt*. Syn: *island mountain*.
- insequent** (in'-se-quent) adj. Said of a stream, valley, drainage system, or type of dissection that is seemingly uncontrolled by the associated rock structure or surface features, being determined by minor inequalities not falling into any larger-scale pattern. Etymol: in + consequent. Syn: *inconsequent*. —n. *insequent stream*.
- insequent stream** A stream developed on the present surface but not consequent upon it and apparently not controlled or adjusted by the rock structure and surface features; a self-guided stream that develops under accidental or chance controls and whose resulting drainage pattern is dendritic, as a young stream wandering irregularly on a nearly level plain underlain by homogeneous or horizontally stratified rocks. The term was proposed by Davis (1897, p. 24). Syn: *insequent*.
- insert** (in'-sert) adj. Having the ocular plates of an echinoid in contact with the periproctal margin. Ant: *exsert*. Syn: *inserted*.
- inset [cart]** (in'-set) *inset map*.
- inset [petrology]** A term proposed by Shand (1947) to replace the term *phenocryst*.
- inset [streams]** A channel where water flows in.
- inset ice stream** An *ice stream* from a tributary glacier that is set into the surface of a larger glacier and does not extend to the bed; e.g. a *superimposed ice stream* set into the surface of a trunk glacier a short distance from their confluence. Cf: *juxtaposed ice stream*.
- inset map** A small, separate map that is positioned within the *neat line*, and in an unimportant part, of a larger map for economy of space or for legibility; e.g. a map of an area geographically outside a map sheet but included therein for convenience of publication, or a part of a larger map drawn at an enlarged or reduced scale. It may or may not be at the same scale as the larger map. Syn: *inset*.
- inset terrace** A *stream terrace* formed during successive periods of vertical and lateral erosion such that remnants of the former valley floor are left on both sides of the valley (Schieferdecker, 1959, term 1512).
- inshore** (in'-shore) (a) Situated close to the shore or indicating a shoreward position; specif. said of a zone of variable width extending from the low-water shoreline through the breaker zone. See also: *offshore*; *nearshore*. (b) In a narrow sense, said of a zone that is equivalent to the *shoreface*.
- inshore water** (a) Water that is adjacent to land, with physical

kitchen facilities for food preparation including but not limited to such facilities as refrigerators, stoves, and ovens. (Norcross, Ga.)

A hotel offering suites with living, kitchen, and sleeping areas. . . . (Aurora, Ill., which uses the term "homotel")

A building or structure intended as, used as, maintained as, or advertised as a place where sleeping accommodations are furnished to the public as regular roomers, primarily for periods of one week or more. (Plymouth, Minn.)

■ **exterior** (See also *facade*) The front facade of any structure and any external features visible from public ways. (Galena, Ill.)

■ **exterior appliance** A central air-conditioning condenser unit, heat pump, or any other noise-producing mechanical system components that are typically required to be located on the exterior of a structure. (West Bloomfield Charter Township, Mich.)

■ **exterior display** The outdoor display of products, vehicles, equipment, and machinery for sale or lease. Exterior display is an outdoor showroom for customers to examine and compare products. There is variety or a distinction among the goods on display through different products, brands, or models. The display area does not have to be visible to the street. Examples of uses that often have exterior display are car and boat sales and plant nurseries. Exterior display does not include goods that are being stored or parked outside. It does not include damaged vehicles, vehicles or equipment being serviced, bulk goods and materials, and other similar products. (Portland, Ore.)

■ **externalities, side effects, spillovers, repercussion effects** The impacts of those other than the direct beneficiaries or targets of a course of action. Externalities may be local or widespread, and may be fiscal, environmental, social, or all three. Much of the recent environmental impact legislation is based on increased understanding of the spillovers of development processes on a community's natural and human environment.

(Handbook for Planning Commissioners in Missouri)

■ **extraction** To draw out or forth; hence to derive as if by drawing out; removal of physical matter in a solid, liquid, or gaseous state from its naturally occurring location; the initial step in use of a natural resource; examples include petroleum and natural gas wells, shale and coal mines, gravel pits, timber cutting. (Glenwood Springs, Colo.)

■ **extractive industry** (See also *mineral extraction; mining; quarry*) The extraction of minerals, including solids, such as coal and ores; liquids, such as crude petroleum; and gases, such as natural gases. The term also includes quarrying; well operation; milling, such as crushing, screening, washing and flotation; and other preparation customarily done at the extraction site or as a part of the extractive activity. (Newport, R.I.)

A use involving on-site extraction of surface or subsurface mineral products or natural resources. Typical uses are quarries, borrow pits, sand and gravel operation, mining, and soil mining. Specifically excluded from this use is grading and removal of dirt associated with an approved site plan or subdivision or excavations associated with, and for the improvement of, a bona fide agricultural use. (Blacksburg, Va., which uses the term "resource extraction")

■ **extraterritorial land-use controls (zoning and subdivision regulations)** Authority granted to certain cities to exercise zoning and subdivision powers for two miles outside their boundaries. It is intended to protect the use of land on the edge of communities from being encroached on by incompatible activities that might degrade adjoining property or cause a nuisance. (The Iowa Code)

■ **exurban area** The region that lies beyond a city and its suburbs. (California Planning Roundtable)

total area of any such mezzanine floor exceeds 33.3 percent of the total floor area in the room or story in which the mezzanine floor occurs, it shall be considered as constituting an additional story. The clear height above or below a mezzanine floor construction shall be not less than seven feet. (*Coral Gables, Fla.*)

An intermediate or fractional story between the floor and ceiling of a main story, used for a purpose accessory to the principal use. A mezzanine is usually just above the ground or main floor and extending over only part of the main floor. The floor area of a mezzanine is included in calculating the floor area ratio of a structure. (*Gurnee, Ill.*)

■ **microbrewery** (See also *brew pub*) A facility for the production and packaging of malt beverages of low alcoholic content for distribution, retail, or wholesale, on or off premise, with a capacity of not more than 15,000 barrels per year. The development may include other uses such as a standard restaurant, bar or live entertainment as otherwise permitted in the zoning district. (*Kalamazoo, Mich.*)

A facility at which beer, fermented on the premises, is bottled and sold. The volume of production of such facility may not exceed 200 gallons a day. (*Dona Ana County, N. Mex.*)

■ **microclimate** The climate of a small, distinct area, such as a city street or a building's courtyard; can be favorably altered through functional landscaping, architecture, or other design features. (*California Planning Roundtable*)

■ **migrant agricultural labor housing** (See *housing, temporary employment*)

■ **mill-type factory structures** (See also *loft building*) Older multistory factories, common in many older industrial areas, and supported by large wood beams and columns. These are popular structures for rehabilitation to activities that are not industrial (art galleries, book selling, computer data centers, mail order centers, etc.). (*APA's Land-Based Classification Standards project*)

■ **mineral extraction** (See also *mining definitions*) The extraction of metallic and nonmetallic minerals or materials, including rock crushing, screening, and the accessory storage of explosives. (*Nashville and Davidson County, Tenn.*)

The excavation or extraction of any earth products of natural mineral deposit, except where such excavation is for purposes of grading for a building lot or roadway, where grass sod is removed to be used for landscaping, or where materials are excavated from a lot for use on that same lot by the owner of the property. (*Cecil County, Md.*)

■ **mineral resource** Land on which known deposits of commercially viable mineral or aggregate deposits exist. This designation is applied to sites determined by the State Division of Mines and Geology as being a resource of regional significance, and is intended to help maintain the quarrying operations and protect them from encroachment of incompatible land uses. (*California Planning Roundtable*)

Rock, sand, gravel, clay, oil, gas, minerals, or similar non-renewable substances occurring in their natural state on or below the surface of the earth, the utilization of which requires some form of excavation. (*Cecil County, Md.*)

■ **minerals** Gravel, sand, and metallic and nonmetallic substances of commercial value. (*Yakima County, Wash.*)

■ **miniature golf course** (See *golf course, miniature*)

■ **mini-lot development** A comprehensively designed development containing lots that do not meet the minimum size or other requirements applying to individual lots in the zone where it is located. (*Oakland, Calif.*)

■ **mini-mall** (See *shopping center, mini-mall*)

■ **minimart** (See *convenience store; gas station minimart*)

■ **mining** (See also *extractive industry; mineral extraction*) All or any part of the process involved in the mining of minerals by removing overburden and mining directly from the mineral de-

posits, open pit mining or minerals naturally exposed, mining by auger method, dredging and quarrying, underground mining and surface work incidental to an underground mine. (*Shasta Lake, Calif.*)

The development or extraction of a mineral from its natural occurrences on affected land. (*Jefferson County, Colo.*)

■ **mining, accessory use** Uses customarily incidental, appropriate, and subordinate to mining located on the same site, such as stockpiling, sorting, screening, washing, crushing, batching, recycling of concrete, asphalt, and related construction materials, maintenance facilities, and contractors' service and storage yards, and concrete products manufacturing that make use of the products produced from the subject mining site. (*Ventura County, Calif.*)

■ **mining, open pit** Strip mining, except that open pit mining is more often deeper with less horizontal area than strip mining. (*El Paso, Tex.*)

■ **mining, strip** A type of open mining in which overburden is removed from the mineral to be mined. The mineral is then dug out directly by shovels, loaders, scrapers, or by other means. (*El Paso, Tex.*)

■ **mining, surface** Processes for the commercial removal of minerals from the surface of the earth. (*Siskiyou County, Calif.*)

■ **mining waste** Accumulations of waste material and overburden placed on the land surface, whether above or below water. (*Island County, Wash.*)

■ **minutes** The chronological record of the proceedings of a public body. (*New York Planning Federation*)

■ **mission** (See *homeless shelter*)

■ **mitigation** For the purposes of administering . . . Sensitive Areas, mitigation includes: (1) avoiding the impact altogether by not taking a certain action or parts of actions; (2) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (3) rectifying the impact by repairing, rehabilitating, or restoring the affected envi-

■ **National Register of Historic Places**

The listing maintained by the U.S. National Park Service of areas that have been designated as historically significant. The Register includes places of local and state significance, as well as those of value to the nation in general. (*Washoe County, Nev.*)

■ **native vegetation** Any indigenous tree, plant, or shrub adapted to soil and climatic conditions occurring on site. (*Nashville and Davidson County, Tenn.*)

Plant communities that develop in the absence of human activities. (*Cecil County, Md.*)

Vegetation comprised of plant species, other than noxious weeds, that are indigenous to the coastal region of the Pacific Northwest and that reasonably could have been expected to naturally occur on the site. (*King County, Wash.*)

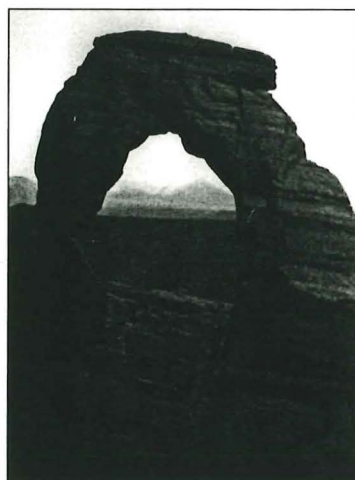
■ **natural condition** That condition that arises from or is found in nature and not modified by human intervention; not to include artificial or manufactured conditions. (*Yakima County, Wash.*)

■ **natural drainage** Channels formed in the existing surface topography of the earth prior to changes made by unnatural causes. (*Westchester County, N.Y.*)

■ **natural features** Components and processes present or produced by nature (pictured below), including soil types, geology, slopes, vegetation, surface water, drainage patterns, aquifers, recharge areas, climate, floodplains, aquatic life, and wildlife. (*Anne Arundel County, Md.*)

Physical characteristics of the subject property that are not man made. (*Federal Way, Wash.*)

■ **natural resource area** Following are considered natural resource areas: *Archaeological Resource:* Any significant evidence of human activity from prehistoric periods including, but not limited to, occupation sites and work areas, evidence of farming, hunting, gathering, burials, and other funeral remains and aboriginal artifacts and structures. This definition also includes, for the purpose of convenience, paleontological specimens and sites; *Historical Resource:* Sites, districts, structures or other evidence of human activities existing for more than 50 years that represent facets of history in the locality, state, or nation which have been officially included in the National or State Register of Historic Places or in the [county] inventory of historical sites; *Mineral Resource:* An area in which minerals are located in sufficient concentration in veins, deposits, bodies, beds, seams, fields, pools or otherwise,



John West

as to be capable of economic recovery. (*Jefferson County, Colo.*)

■ **naturalized species** Non-native species of vegetation that are adaptable to the climatic conditions of the coastal region of the Pacific Northwest. (*King County, Wash.*)

■ **navigable waters** Waterways used or susceptible of being used in their natural or ordinary condition as highways for commerce over which trade and travel are or may be conducted in customary modes of trade and travel on water. (*Riverhead, N.Y.*)

■ **neighborhood** An area of a community with characteristics that distinguish it from other community areas and that may include schools, or social clubs, or boundaries defined by physical barriers, such as major highways and railroads, or natural features, such as rivers. (*Iowa State University Extension Service*)

A subarea of the city in which the residents share a common identity focused around a school, park, community business center, or other feature. (*Renton, Wash.*)

The smallest sub-area in planning, defined as a residential area whose residents have public facilities and social institutions in common, and generally within walking distance of their homes. (*Handbook for Planning Commissioners in Missouri*)

■ **neighborhood convenience store** (See also *convenience store*) Establishments primarily engaged in the provision of frequently or recurrently needed goods for household consumption, such as prepackaged food and beverages and limited household supplies and hardware. Convenience stores shall not include fuel pumps or the selling of fuel for motor vehicles. Typical uses include neighborhood markets and country stores. (*Blacksburg, Va.*)

■ **neighborhood plan** The master plan for a particular neighborhood or district that provides specific design standards and guidelines regulating the development and use of the property. (*Orlando, Fla.*)

open space, common An open space within a residential development reserved for the exclusive use of residents of the development and their guests. (*Newport Beach, Calif.*)

The total land area, not individually owned or dedicated for public use, which is designed and intended for the common use or enjoyment of the residents or occupants of a development. Common open space includes swimming pools, putting greens, and other recreational-leisure facilities; areas of scenic or natural beauty and habitat areas; hiking, riding, or off-street bicycle trails; and landscaped areas adjacent to roads that are in excess of minimum required rights-of-way. (*Washoe County, Nev.*)

Land within or related to a development, not individually owned or dedicated for public use, that is designed and intended for the common use or enjoyment of the residents of the development and may include such complementary structures and improvements as are necessary and appropriate. (*Schaumburg, Ill.*)

open space, detached Required open space that is not on the same lot(s) as the dwellings for which the open space is required. (*Albuquerque, N. Mex.*)

open space, developed Open space substantially free of structures but possibly containing improvements that are part of a development plan or are appropriate for the residents of any residential development. (*Palm Desert, Calif.*)

open space element An inventory of privately and publicly owned open space lands, and adopted goals, policies, and implementation programs for the preservation, protection, and management of open space lands. (*California Planning Roundtable*)

open space, natural Any parcel of land or water that is essentially unimproved and devoted to an open space use. (*Palm Desert, Calif.*)

An open space area not occupied by any structure or impervious surface. (*Siskiyou County, Calif.*)

open space, passive Open space that is essentially unimproved and set aside, dedicated, designated, or reserved for public or private use or for the use and enjoyment of owners or occupants. (*Redmond, Wash.*)

open space, private A usable open space adjoining and directly accessible to a dwelling unit, reserved for the exclusive use of residents of the dwelling unit and their guests. (*Newport Beach, Calif.*)

The outdoor living area directly adjoining a dwelling unit or building, intended for the private enjoyment of the residents or occupants of the dwelling unit or building and defined in such a manner that its boundaries are evident. (*Washoe County, Nev.*)

open space ratio A measure of the intensity of land use, determined by dividing the total of all open space areas contained within a site by the gross site area. (*Island County, Wash.*)

open space, total The sum of private open space and shared open space. (*Newport Beach, Calif.*)

open space, usable Outdoor or unenclosed area on the ground, or on a roof, balcony, deck, porch, or terrace designed and accessible for outdoor living, recreation, pedestrian access, or landscaping, but excluding parking facilities, driveways, utility or service areas, or any required front or street side yard, and excluding any space with a dimension of less than six feet in any direction. (*Newport Beach, Calif.*)

open space use The current employment of land, the preservation of which use would conserve and enhance natural or scenic resources, protect streams and water supplies, or preserve sites designated as historic pursuant to law, provided such land has a greater value for another use than for open space use. (*Washoe County, Nev.*)

orchard The establishment, care, and harvesting of more than 25 fruit bearing trees, such as persimmon, guava, banana, or papaya, for the purpose of selling the fruit to others. (*Kauai, Hawaii*)

A group of fruit or nut trees, either small and diverse and grown for home use, or large and uniform (i.e., of one variety) and cultivated for revenue. Such a collection must be planted, managed, and renewed by the householder or farmer and should not be confused with a naturally occurring grove. Citrus and nut plantations are customarily called groves. (*California Planning Roundtable*)

ordinance A law or regulation set forth and adopted by a governmental authority, usually a city or county. (*Jefferson County, Colo.*)

organic material A material or substance composed of chemical compounds of carbon in combination with other chemical elements (often hydrogen) and generally manufactured in the life processes of plants and animals. Organic substances include paper, wood, food and plastic, as well as the waste products of these and similar materials. (*Gurnee, Ill.*)


origin and destination survey (*See trip*)

outbuilding (*See also accessory structure*) A separate accessory building or structure not physically connected to the principal building. (*Siskiyou County, Calif.*)

outdoor advertising display (*See also sign definitions*) A fixed or portable appliance, structure, or surface, including the supporting structure made necessary thereby, erected upon the ground, on the wall of a building, or above the roof of a building, and used and erected for the public display of posters, painted displays, electrical displays, pictures, or other pictorial or reading matter for the benefit of a person, organization, business, or cause not residing or located on the lot or in the building where the appliance, structure, or surface is erected. (*Orrville, Ohio*)

outdoor customer dining area (*See restaurant, outdoor customer dining area*)

outdoor display area (*See also retail sales establishment definitions*) An area of designated size used for the display of merchandise or tangible property normally vended within the contiguous



■ **quality of life** The attributes or amenities that combine to make an area a good place to live. Examples include the availability of political, educational, and social support systems; good relations among constituent groups; a healthy physical environment; and economic opportunities for both individuals and businesses. (*Indianapolis, Ind.*)

■ **quarry** A lot or land or part thereof used for the purpose of extracting stone, sand, gravel, or top soil for sale and exclusive of the process of grading a lot preparatory to the construction of a building for which application for a building permit has been made. (*Farragut, Tenn.*)

An open pit from which building stone, sand, gravel, mineral, or fill is taken to be processed for commercial purposes. (*El Paso, Tex.*)

■ **quarry/pit rehabilitation** To provide slopes that will be covered with a layer of soil and revegetated where prac-

tical. It applies to the rehabilitation of all kinds of sand, gravel, and rock excavations to obtain fill or construction materials and from which no further removal of materials is intended, as well as to resource extraction. Rehabilitation is intended to minimize the hazardous and unsightly nature of abandoned pits, and if practical, to return the area to some productive use. (*Unalaska, Alaska*)

■ **quarter/quarter zoning** (See also *agricultural protection zoning*) A quarter of a quarter-section of land (1/16 of 640 acres or 40 acres). A nonexclusive, density-based zoning method designed to preserve farmland indefinitely. A limited number of nonfarm homes are allowed for every 40 acres of land. This technique is most appropriate in rural areas with large farming operations and moderate growth pressures where average parcel sizes exceed 40 acres. (*Michigan Townships Association*)

■ **quasi-public use/quasi-public facility** A use conducted by, or a facility or structure owned or operated by, a nonprofit, religious, or eleemosynary institution that provides educational, cultural, recreational, religious, or other similar types of public services. (*Maui County, Hawaii*)

Institutional, academic, governmental, and community service uses, either owned publicly or operated by nonprofit organizations, including private hospitals and cemeteries. (*California Planning Roundtable*)

■ **queue space** (See also *stacking lane*) A temporary waiting area for motor vehicles obtaining a service or other activity. (*Newport Beach, Calif.*)

EXCAVATION

is used. Thus, an exaction fee from an office use, based on the amount of square feet, could be used for lower income housing or traffic improvements that are directly impacted by the office space.

Removal or recovery by any means whatsoever of soil, rock, minerals, mineral substances, or organic substances, other than vegetation, from water or land, on or beneath the surface thereof, or beneath the land surface, whether exposed or submerged.

EXCEPTION

Permission to depart from the design standards in the ordinance. *See* WAIVER.

Comment: The design standards are those outside the zoning ordinance or zoning chapter. Those require a variance that must be based on specific criteria such as hardship, special reasons, change of circumstances, and so forth. The exception often refers to design standards such as length of cul-de-sacs, location and type of improvements, and landscaping requirements. They are dictated by the circumstances related to the specific application that make the design requirement for which the exception is requested unnecessary or unreasonable.

As in the case of waivers, the approving agency must make findings and conclusions before granting the exception.

EXCLUSIONARY ZONING

Development regulations that result in the exclusion of low- and moderate-income and minority families from a community.

Comment: Exclusionary zoning may also serve to keep out, or limit, additional development. Exclusionary zoning provisions include allowing only large lot, single-family detached dwellings, bulk regulations in excess of that needed for health and safety, barring of multifamily development, and excessive improvement requirements that generate unnecessary costs.

EXCLUSIVE USE DISTRICT

A zoning district that allows only one use or a limited range of use types.

**EXECUTIVE
HEADQUARTERS**

An office building occupied almost entirely by the principal office of a business or corporation.

Comment: Usually, the executive headquarters (or corporate headquarters) bears the name of the corporation

MILL

One-tenth of a cent.

Comment: The term is still used in matters relating to taxes.

MINE

(1) A cavity in the earth from which minerals and ores are extracted; (2) the act of removing minerals and ores.

MINERAL RIGHTS

One of a number of distinct and separate rights associated with real property that gives the owner of rights certain specified privileges, such as to extract, sell, and receive royalties with respect to the minerals.

Comment: The holder of mineral rights, in some cases, may be able to exercise those rights to the detriment of all other rights. For example, if the mineral rights owner has the right to explore or mine the minerals, it could severely affect the remainder of the land.

MINI-MALL

A shopping center of between 80,000 to 150,000 square feet on a site of eight to fifteen acres where tenants are located on both sides of a covered walkway with direct pedestrian access to all establishments from the walkway. *See* SHOPPING CENTER; SHOPPING MALL; SPECIALTY SHOPPING CENTER.

MINI-WAREHOUSE

See SELF-SERVICE STORAGE FACILITY.

MINIMAL ACCESSIBILITY

An environment that will afford a handicapped person access with difficulty. Some assistance may be required.

MINING

The extraction of minerals, including solids, such as coal and ores; liquids, such as crude petroleum; and gases, such as natural gases.

Comment: The term also includes quarrying; ground-water diversion; soil removal; milling, such as crushing, screening, washing, and flotation; and other preparation customarily done at the mine site or as part of a mining activity.

MINOR SUBDIVISION

See SUBDIVISION, MINOR.

MINOR TRAFFIC GENERATOR

The use or uses that generate less than a total of five hundred vehicle trips per day. *See* MAJOR TRAFFIC GENERATOR.

Preservation and authorized grants-in-aid for historic properties preservation.

The official list, established by the National Historic Preservation Act, of sites, districts, buildings, structures, and objects significant in the nation's history or whose artistic or architectural value is unique.

Comment: Listing on the National Register does not restrict any activities or actions of the property owner. It does, however, place limits on any actions of the federal government that might damage the historic nature of the property. Some states have a similar register. Only local historic district ordinances can place limits on the actions of a private property owner with respect to a property in that district. *See* HISTORIC AREA; HISTORIC BUILDING; HISTORIC BUILDING STYLES; HISTORIC PRESERVATION; HISTORIC SITE; NATIONAL HISTORIC PRESERVATION ACT.

The pattern of surface and stormwater drainage from a particular site before the construction or installation of improvements or prior to any regrading.

See GRADE, NATURAL.

The ground surface in its original state before any grading, excavation, or filling. *See* GRADE, NATURAL.

(1) A natural feature or object used to define or mark a boundary; (2) any large, remarkable natural feature.

Adding water to an aquifer by natural means, such as precipitation, or from lakes and rivers.

A survey of existing natural elements relating to land, water, air, plant, and animal life of an area or a community and the interrelationship of these elements. The NRI usually includes data on soils, geology, topography (including watershed and flood areas), and vegetation.

Comment: The NRI (also known as the environmental resources inventory) is an important input to master plan preparation and is useful in the review of subdivision and other development plans. Such studies primarily indicate which areas are environmentally suitable for development and which are not. Depending on study detail, they

also can provide: (1) indices of development capacity; (2) background information useful in the preparation of environmental impact statements; (3) disclosure of current imbalances between development and the environment; and (4) information to residents on the environmental impacts of development.

The NRI is an areawide inventory and, as such, its data may not be sufficiently precise for use in the preparation or detailed review of specific development projects. One of the initial steps in the design review procedure, though, is a check of the proposed plans against the findings of the natural resources inventory. This check may provide some design direction or at least alert the reviewing authority of potential environmental problems. This review also may suggest that an environmental impact statement may be necessary.

NATURAL SELECTION

The natural process by which organisms best adapted to their environment survive and those less well adapted are eliminated.

NATURE PRESERVE

Areas in which human activities are very limited and where the natural environment is protected from man-made changes.

Comment: Nature preserves may be large holdings protected by governmental ownership or small parcels restricted by conservation easements. Nature preserve uses are usually limited to hiking and walking trails.

NEGATIVE EASEMENT

See EASEMENT, NEGATIVE.

NEIGHBORHOOD

An area of a community with characteristics that distinguish it from other areas and that may include distinct ethnic or economic characteristics, housing types, schools, or boundaries defined by physical barriers, such as major highways and railroads or natural features, such as rivers.

Comment: Historically, the neighborhood was defined as the area served by an elementary school, with shopping and recreation facilities to serve neighborhood residents. While the description is probably dated, the neighborhood designation is useful in analyzing the adequacy of facilities and services and in identifying factors affecting the quality of the built environment. In addition, as a distinct and identifiable area, often with its own name,

LIGHT BURN

LIGHT BURN A degree of burn that leave covered with partially charred organic material. Heavy fuels are not deeply charred. Fire Severity; Moderate Burn; Severe Burn

LIGHT FUELS See Fine Fuels.

LIGHT HELICOPTER A helicopter with a maximum certified gross weight for takeoff and landing of 6,000 pounds or less. See also Heavy Helicopter; Medium Helicopter.

LIGHTNING Atmospheric electrical discharges between clouds or from clouds to earth, which allow the electrical charge leaked into the atmosphere to return to earth.

LIGHTNING ACTIVITY LEVEL (LAL) In the US National Fire Danger Rating System, a number on a scale of 1 to 6 that reflects frequency and character of cloud-to-ground lightning (forecasted or observed). The scale is exponential, based on powers of two (i.e., LAL 3 indicates twice the lightning activity of LAL 2). See also Lightning Fire Occurrence Index; Lightning Risk.

LIGHTNING FIRE See Fire Cause Class.

LIGHTNING FIRE OCCURRENCE INDEX In the US National Fire Danger Rating System, a numerical rating of the potential occurrence of lightning-caused fires. See also Lightning Activity Level; Lightning Risk.

LIGHTNING LOCATOR SYSTEM A network of electronic field sensors linked to a central computer to detect, triangulate, plot the location, and record cloud-to-ground lightning flashes in real time over a large predetermined area. In the US, the system is termed an Automatic Lightning Detection System (ALDS).

LIGHTNING RISK (LR) In the US National Fire Danger Rating System, a number related to the expected number of cloud-to-ground lightning strikes to which a protection unit is expected to be exposed during the rating period. The LR value used in the occurrence index includes an adjustment for lightning activity experienced during the previous day to account for possible holdover fires. See also Human-Caused Risk; Lightning Activity Level; Lightning Fire Occurrence Index.

LIGHTNING RISK SCALING FACTOR In the US National Fire Danger Rating System, a factor derived from local thunderstorm and lightning-caused fire records that adjusts predictions of the basic lightning fire occurrence model to local experience, accounting for factors not addressed directly by the model (e.g., susceptibility of local fuels to ignition by lightning, fuel continuity, topography, regional characteristics of thunderstorms). See also Human-Caused

Risk; Lightning Risk.

E COUNTER An electronic device that determines the number of lightning strikes in a predetermined range over a specified time.

LIGHT WIND A wind speed of less than seven miles per hour (six knots) measured at twenty feet above ground. At eye level, light winds are less than three miles per hour (three knots).

LIGNEOUS Woody, as in woody plants containing lignin.

LIGNICOLOUS Growing on decorticated wood, not on living bark.

LIGNIN The non-carbohydrate (non-cellulose) fraction of wood, lignin acts as a binding material in the intercellular layer of plant tissues. It is a complex polymer, and gives woody tissues structural rigidity. Chemically intractable and insoluble, it amounts to 15 to 35 per cent by weight of the cell wall material, and is used mainly as a fuel in the pulping process. See also Cellulose.

LIGNITUBER A peglike protrusion, made of lignin or similar materials, covering the host cell wall that is induced by a penetrating fungal hyphae. See also Lignotuber.

LIGNOTUBER A woody swelling just above or below the ground, containing adventitious shoots with the potential to develop if the top of the plant is cut or otherwise damaged. See also Lignituber.

LIGULATE Strap-shaped, more narrowly so than in lorate. See also Lorate.

LIGULE 1 A strap-shaped organ or body, especially a strap-shaped corolla, such as the limb of the ray florets of plants in the Compositae family. 2 A projection from the top of the sheath in grasses, palms, and certain other plants. See also Grass (for illustration).

LIKERT SCALES See Measurement.

LIMB 1 In animals, an articulated projection used for locomotion (e.g., leg, arm, or wing).

2 In plants, the expanded flat part of an organ, such as a petal, or the expanding part of a gamopetalous corolla. 3 A branch of a tree.

LIMESTONE A sedimentary rock consisting mainly (greater than 50 per cent) of calcium carbonate, typically as calcite. Limestone is formed by a combination of organic and inorganic processes and includes chemical and diagenetic (soluble and insoluble) constituents. Many forms of limestone contain fossils.

LIMESTONE PAVEMENT A more or less horizontal exposure of limestone, usually coinciding with a bedding plane and consisting of irregular

MIGRATION ROUTE

or stringer of vegetation that provides a completely or partially suitable habitat and which animals follow during migration.

MIGRATION ROUTE A path or route followed by migrating birds and animals.

MINE 1 As a verb, the act of tunnelling and digging out the ground in order to remove one or more component parts of the mined material (e.g., coal, gold). 2 Also refers to insect larvae that mine their way into leaves or other parts of a plant. 3 As a noun, a mine is a complex of underground tunnels, only a few of which actually connect to the surface, often via a central mine shaft. An **adit** is a tunnel connecting to a mine from a side slope for access or drainage. A **pit** is a hole in the ground, of varying size, that is open to the sky and has been created for the purpose of extracting minerals or aggregates. In some places, an underground mine complex is generically referred to as the 'pit.' Pits may also provide access to tunnels and mines. **Levels** are the varying depths of work in a mine. 4 Refers to tunnels created by leaf-mining insect larvae.

MINERAL A non-technical word more specifically defined by legislation, usually involving one or more of the following: (1) a scientifically recognized inorganic material; (2) a material classified commercially as a mineral; (3) a material derived from the earth that possesses economic value and utility aside from the agricultural purposes of the land surface itself.

Minerals include sand, gravel (common minerals), precious or semi-precious stones, coal, petroleum resources, and natural gas, even though the latter three are not inorganic. Some definitions limit the term to inorganic materials having a distinct chemical composition, characteristic crystalline structure, colour, and hardness.

MINERAL ASH The residue of mineral matter left after complete combustion of wood or other organic matter. It consists largely of oxides, carbonates, and phosphates of calcium, potassium and magnesium, together with other compounds.

MINERALIZATION The transformation of an element from its organic to inorganic form due to microbial activity. *See also* Immobilization.

MINERAL RIGHTS The ownership or rights of access to minerals under a given surface; the legal right to enter the area and mine or otherwise remove them, including clearly defined rights about the extent of the land surface that can be used in the process of removing miner-

als and, in some cases, the remedial work that must be undertaken to restore the land surface upon completion of the mineral extraction activity. Note that mineral rights are distinct from surface rights.

MINERAL SOIL Any soil composed of mineral materials. The minerals are usually classified as primary or secondary. Primary minerals are formed at high temperatures and/or pressures in igneous and metamorphic rocks and have not undergone chemical modification since crystallization. Secondary minerals are formed at low temperatures and pressures, found at or near the Earth's surface in sedimentary rocks or soils, and originate from the decomposition of primary minerals. Mineral soil characteristics reflect their creation by weathering processes rather than by biological processes. *See also* Mineral; Organic Soils.

MINERAL SUITE A set of minerals that occurs in close association, generally representing a related formation.

MINEROTROPHIC Used to describe wetlands that are nourished by mineral-rich waters. *See also* Ombrotrophic.

MINIMUM FLOW The quantity of water needed to maintain the existing and planned-in-place uses of water in or along a stream channel or other water body, and to maintain the natural character of the aquatic system and its dependent systems.

MINIMUM VIABLE POPULATION The smallest isolated population having an x per cent chance of remaining extant for y years, despite the foreseeable effects of demographic, environmental, and genetic stochasticity and natural catastrophes. The probability of persistence x and y must be socially determined. *See also* Viable Population.

MINISONDE OBSERVATION A method of constructing a vertical temperature profile determined by air temperature data being continuously telemetered to a portable receiver unit at the Earth's surface from a transmitting sensor package that is carried aloft by a free-lift balloon. Winds aloft may also be determined at the same time for the purpose of constructing a vertical wind profile by employing the procedures used for a pilot balloon observation. *See also* Helicopter Sounding; Rawinsonde Observation.

MIRE A peatland. An area having a deposit of organic soil.

MISTLETOE Flowering plants belonging to the Loranthaceae family and which are parasitic on

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plotted and compared for navigational purposes. *See also* UTM.

SPECIES Usually, a species known to exist on a site prior to the influence of disturbance. It depends on the temporal and spatial context of analysis, since long-established species are often considered to be native to the area. *See also* Exotic Species.

NATURAL AREAS In Canada, natural areas are those that fulfil one or more of the following criteria: (1) They are natural or near natural in character and relatively undisturbed, or else in the process of recovery from human disturbance. (2) They are significant regional habitats for either typical or endangered plant or animal species. (3) They encompass one or more regionally characteristic or rare natural systems. (4) They contain typical or unusual geological formations or archaeological sites. (5) They exhibit diverse scenery or natural physiographic features of scientific, educational, aesthetic, or cultural value. Natural areas are judged to be very important to the welfare of humanity and are considered to be necessary for the following reasons: they help to maintain the diversity of living organisms through the conservation of wild resources; (2) they offer areas for research on relatively natural vegetation for comparison with managed and utilized vegetation; (3) they are outdoor laboratories for a variety of research programs; and (4) they are used as museums to serve outdoor education purposes and to inspire an intellectual understanding and aesthetic appreciation of the natural world.

NATURAL BARRIER Any area where lack of permeable material obstructs the spread of organisms.

NATURAL CAVITY A naturally occurring space in a tree, downed log, rock face, or other structure that is used for nesting and/or thermal protection.

NATURAL ECOSYSTEM An ecosystem that is minimally influenced by humans and that is, in the long sense, diverse, resilient, and sustainable.

NATURAL ENEMIES The parasites, parasitoids, predators, and pathogens associated in nature with a specific wild population of plants or animals.

NATURAL FIRES Any fire of natural origin (e.g., lightning, spontaneous combustion, volcanic activity). *See also* Prescribed Fire; Wildfire.

NATURAL FOREST A forest area that has developed free from the influence of humans and

remains largely unaffected by their activities. The natural forest may include, but is not necessarily equivalent to, an old-growth forest. *See also* Forest.

NATURAL FUELS Fuels resulting from a natural process and not directly generated or altered by land management practices. *See also* Activity Fuels.

NATURAL LANDSCAPE An area where human effects, if present, are not ecologically significant to the landscape as a whole.

NATURAL MOISTURE CONTENT The moisture content of soil or surficial material at the time a sample was collected.

NATURAL REGENERATION The renewal of a forest stand by natural rather than human means, such as seeding-in from adjacent stands, with the seed being deposited by wind, birds, or animals. Regeneration may also originate from sprouting, suckering, or layering. *See also* Artificial Regeneration.

NATURAL RESOURCES The term encompasses renewable resources, such as forests, water, wildlife, soils, etc., and non-renewable resources, such as coal, oil, and ores, all of which are natural assets.

NATURAL SELECTION *See* Selection.

NATURAL TARGET CUT A pruning technique where only branch tissue is removed, with removal occurring just beyond the branch collar. *See also* Branch Collar; Flush Cut; Pruning.

NATURAL VARIATION *See* Range of Variability.

NATURE RESERVE An area of land set aside to maintain it in its natural condition. In a North American context, reserves are typically undisturbed or only slightly disturbed lands. In a European context, they can include quite severely disturbed lands. Reserves serve as a baseline for studying ecological baselines of natural change (background effects) and reaction to induced change (direct and active disturbance).

NAVICULAR Shaped like a boat with a deep keel (e.g., the glumes on many grasses).

NECROSIS The death or disintegration of cells or tissues while still part of a living organism, often manifested by the appearance of patches of dead tissue (necrotic) surrounded by living tissue. Necrotic plant tissue is usually darker and can be a symptom of mineral deficiencies or viral disease.

NECROTIC SPOT A dead area on a living plant. It is often caused by biotic and abiotic injury.

NECROTROPHIC Any organism that uses dead plant or animal tissues to meet its nutritional

NEGOTIATION

requirements. *See also* Saprophyte.

NECTAR In plants and certain fungi, a secreted sugar solution that attracts insects.

NECTARIVORE Any animal that eats nectar for all or a part of its diet.

NECTARY A nectar-secreting gland, usually seen as a small pit or protuberance.

NEEDLE CAST 1 The premature shedding of needles in conifers, often in May or June.

Frequently associated with attack by certain ascomycete fungi, but sometimes caused by non-infectious agents. 2 A disease characterized by these symptoms.

NEEDLE COMPLEMENT The normal or usual number of needles that a conifer of a particular species will bear.

NEEDLE ICE Ice crystals caused by frost-heaving in rocks and soil.

NEEDLE-LEAVED Refers to coniferous trees, where there are many small, needlelike leaves covering the entire tree. *See also* Conifer Leaves.

NEEDLE MINER An insect that lives and feeds as a larva within the inner tissues of coniferous needles.

NEEDLE SPOTTING A needle disease characterized by isolated circular or elongate lesions.

NEEDS The fundamental motivations and requirements of living organisms, as opposed to wants or desires; the latter being requirements that come after basic necessities have been met. In human populations, there is a considerable overlap between the terms 'needs' and 'wants.' Some might argue that needs considered essential in one culture are in fact extravagances in another. Typical basic needs are food, shelter, clothing, potable water, and breathable air.

NEGATIVE FEEDBACK A loop where one component stimulates a second component, but the second then inhibits the first. *See also* Feedback; Positive Feedback.

NEGOTIATION Explicit bargaining. Negotiations occur when two or more entities enter into a direct exchange, typically involving face-to-face meetings, in an attempt to find some resolution to their differences. It is based on the understanding (or assumption) that an agreement will involve a commitment to act within the terms of the agreement. Negotiation is a form of shared decisionmaking (i.e., on a certain set of issues for a period of time, those involved agree to seek an outcome acceptable to all involved). Should the negotiations fail to result in agreement, the participants revert to pursuing their interests as appropriate, whether

RESINOSIS

or produced in response to insect attack. *See also* Oleoresin; Resinosis.

RESINOSIS 1 A copious flow of resin or pitch on the bark of a conifer in response to infection, wounding, or insect attack. 2 Impregnation of tissue with resin or pitch.

RESISTANCE 1 The ability of a plant to overcome, retard, suppress, or prevent infection or colonization by a pathogen, parasite, or adverse abiotic factor. 2 The ability of insects, fungi, weeds, or other pests to survive normally lethal doses of an insecticide, fungicide, herbicide, or other pesticide. The opposite of susceptibility.

RESISTANCE TO CONTROL The relative ease of establishing and holding a fireguard and/or securing a control line as determined by the difficulty of control and resistance to fire guard construction. *See also* Difficulty of Control; Resistance to Fire Guard Construction.

RESISTANCE TO FIRE GUARD CONSTRUCTION The relative difficulty of constructing fire guards as determined by fuel type characteristics (e.g., forest floor depth), effects of topography on access (e.g., slope steepness), and mineral soil type. *See also* Difficulty of Control; Resistance to Control.

RESOLUTION 1 A measure of the ability of a remote sensing system to reproduce an isolated object or to separate closely spaced objects or lines. It is usually expressed as the number of lines per millimetre. 2 Solving a problem. *See also* Alternative Dispute Resolution.

RESOURCE 1 Generally, anything that is useful for something, be it animal, vegetable, mineral, a location, a labour force, etc. Resources can be tangible commodities or abstract concepts, such as aesthetics. The concept of 'resource' presupposes an appraisal of the usefulness of an object or environment for some purpose. What constitutes a 'resource' is a relative concept whose definition changes depending on the purpose or point of view. 2 More narrowly, a substance or object required by an organism for normal maintenance, growth, and reproduction.

RESOURCE INDUSTRY An industry based on the primary resources obtained from agriculture, fisheries, forestry, or mining.

RESOURCE PARTITIONING A coexistence strategy evolved by plants and animals to avoid competitive exclusion from a site. It is achieved by taking advantage of the jointly available resources through variations in seasonal growth patterns and resource usage (e.g., understorey plants in deciduous forests com-

pensate for the lack of sunlight throughout most of the year by completing much of their growth in spring before the overstorey leaves block the sunlight. In insects, resource partitioning of plant parts often occurs so that certain species utilize different sizes of branches or different parts of the trunk at the same time.

RESOURCEISM A view and approach that espouses the idea that all of the other beings of Earth are here only to serve human needs and desires, that we can use them as experimental subjects and can sacrifice them for our benefit. *See also* Anthropocentric; Deep Ecology; Ecocentric.

RESPONSE TIME *See* Elapsed Time (get-away time).

RESTORATION A process of returning ecosystems or habitats to their original structure and species composition. Restoration requires a detailed knowledge of the (original) species, ecosystem functions, and interacting processes involved. *See also* Reclamation; Rehabilitation.

RESTORATION AND RETENTION BLOCKS Areas of forest reserved and managed to restore or retain old-growth communities and respective plant communities.

RESTRICTIVE LAYER A layer or band in the soil that restricts penetration of moisture or roots. Could be bedrock, cemented soil horizons, extremely compacted materials, or layers having chemical concentrations such as carbonates.

RESUPINATE Describes a fungal body that is reclined or flat on the host or the ground.

RESURGENCE A rapid recovery of numbers of a pest population, which had been significantly reduced by pesticide treatment, due to decreased, intraspecific competition at low densities and/or pesticide-caused mortality of natural enemies.

RETARDANT *See* Fire Retardant.

RETARDANT COVERAGE The area of fuel covered and the degree of coverage on the fuel by a fire retardant, usually expressed in terms of volume per unit area.

RETICULATE A surface or form having a netlike or netlike appearance.

RETICULUM A network or netlike arrangement of structures.

RETROGRESSION The retreat or deterioration of a plant community from a later stage of succession to an earlier one, usually brought about by biotic changes or other influences of human activity. *See also* Regression.

RETRORSE Turned backward or downward. *See also* Antrorse; Extrorse; Introrse.

Dictionary of Natural Resource Mgmt.

- Julian + Katherine Dunster

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THE MINERAL INDUSTRY OF FLORIDA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Florida Geological Survey for collecting information on all nonfuel minerals.

In 1999, the preliminary estimated value¹ of nonfuel mineral production for Florida was about \$1.9 billion, according to the U.S. Geological Survey (USGS). This was a more than 6% increase from that of 1998,² and followed a 1.1% decrease in 1998 from 1997. The increase continued an overall upward trend that began in 1994, following 4 years of lower values. In 1999, for the third time in the past 4 years, Florida ranked fourth among the 50 States in total nonfuel mineral production value, of which the State accounted for almost 5% of the U.S. total.

Florida continued to be the Nation's leading phosphate rock-mining State in 1999, producing more than six times as much as the next-highest producing State. Phosphate rock is produced in only four States. In terms of value, phosphate rock, crushed stone, and portland cement continued to be the most important raw mineral commodities produced in Florida. (Listings of mineral commodities are in descending order of value, magnitude of change in value, or quantity produced.) In 1999, increases of \$80 million in phosphate rock, \$32 million in crushed stone, \$12 million in construction sand and gravel, and \$6 million in portland cement led the State's increase in value (table 1). Relatively smaller increases in masonry cement and several other mineral commodities contributed to the overall increase. The only significant decrease was a \$12 million drop in the value of zircon concentrates. In 1998, significant decreases occurred in the values of fuller's earth, crushed stone, portland cement, zircon concentrates, and ilmenite and rutile titanium concentrates. These decreases more than offset a substantial increase in the value of phosphate rock, moderate gain in construction sand and gravel, and smaller increases in masonry cement and peat, resulting in a net decrease for the year (table 1).

Based upon USGS preliminary estimates of production in the 50 States in 1999, Florida remained the only State to

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1999 USGS mineral production data published in this chapter are preliminary estimates as of May 2000, and are expected to change. For some mineral commodities, such as, construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals/contacts/comdir.html>, by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists), or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>; facsimile copies may be obtained from MINES FaxBack.

²Values, percentage calculations, and rankings for 1998 may vary from the Minerals Yearbook, Area Reports: Domestic 1998, Volume II, owing to the revision of preliminary 1998 to final 1998 data. Data for 1999 are preliminary and are expected to change; related rankings may also be subject to change.

produce rutile concentrates and staurolite; it was first in peat and masonry cement, first of two States producing zircon concentrates, and first of three States producing ilmenite concentrates. Florida continued to be third in crushed stone production, fourth in fuller's earth, seventh in portland cement, and dropped from third to fourth in magnesium compounds. Additionally, Florida produced substantial quantities of construction and industrial sand and gravel.

The Florida Geological Survey³ (FGS) provided the following narrative information. Most employment in Florida's mining industry was associated with the mining and processing of minerals and materials used in the State's construction industry. Based upon information the FGS received from the U.S. Department of Labor's Mine Safety and Health Administration, 6,464 persons were employed at Florida mines and mills and another 1,037 persons were employed as office staff during 1999. The limestone sector was the largest employer with over 3,150 employees, and the phosphate industry was second with nearly 2,500 workers. Most of the remaining was employment at sand and gravel, cement, heavy mineral sand, and clay mine pit operations.

Most of the stone mined in Florida was used for road construction. Florida Rock Industries, Inc. acquired Harper Brothers, Inc.'s aggregate mining and highway and heavy construction business in Ft. Myers, FL (North American Quarry News, 1999a). Southdown, Inc. agreed to acquire Sunshine Materials, Inc.'s limestone quarry site in west-central Florida (North American Quarry News, 1999b). Martin-Marietta Materials, Inc. obtained an Environmental Resource Permit (ERP) from the Florida Department of Environmental Protection's Suwannee River Water Management District for an expansion of its Perry Quarry, which was formerly operated by Florida Rock Industries, Inc. Angelo's Aggregate Materials, Ltd. proceeded with an ERP application for its Jasper Pit in Madison County. Angelo's, currently producing sand from the Jasper Pit, was developing plans to excavate limestone from portions of the Jasper Pit, in addition to its sand production. The operators of several other limestone mines, although smaller than Martin-Marietta's Perry Quarry, filed ERP applications as part of their plans to reactivate their operations. Some of the limestone is from high-purity deposits, which can be calcined (heated) and, together with other ingredients, can be used to manufacture portland and masonry cement. During the past year, Florida Rock Industries, Inc. brought its Newberry cement plant on-line and began production.

The State's sand and gravel resources can be subdivided into construction and industrial, the bulk of which is construction grade. Florida ranks approximately 15th in the Nation in construction sand and gravel used or produced and 20th in industrial sand. Whereas sand is mined at many locations throughout the State, quartz gravel is mined only along

³Steven Spencer, Coastal/Economic Geologist, authored the text submitted by the Florida Geological Survey.

the Trail Ridge region of the peninsula and in the far northwestern regions of Florida. CSR America, Inc. (parent company of Rinker Materials Corp.) acquired Harper Brothers, Inc., Palmdale Sand Mine in Glades County, Florida. (Leu Newman, Florida Department of Environmental Protection, Bureau of Mine Reclamation, oral commun., 2000).

The Gypsum Division of Lafarge Corp. announced plans to open a new wallboard plant in Putnam County (North American Quarry News, 1999c).

Common, fuller's earth, and kaolin clays were mined in a few locations in Florida. Fuller's earth, typically used as an absorbent material, was mined in Gadsden and Marion Counties; kaolin, often used in the manufacture of paper and refractories, was mined in Putnam County; and common clay, often used in the manufacture of brick, cement, and lightweight aggregate, was mined in small quantities from various locations throughout the State.

Two of five companies that mine heavy minerals in the United States are located in Florida. E.I. du Pont de Nemours, Co., and RGC (USA) Mineral Sands, Inc. mined respectively in Bradford and Clay Counties, which are in northeastern Florida. Following a merger of RGC's Australian parent company with another Australian company, the heavy mineral mines of Green Cove Springs and Putnam East Extended Satellite operated under the name Iluka Resources, Inc. A variety of minerals are found in Florida's heavy mineral sand deposits, including ilmenite, leucoxene, rutile (titanium minerals), and zircon. Ilmenite and rutile are primary source materials used to manufacture titanium dioxide pigments. These pigments are often used in the manufacture of paint, varnish and lacquers, plastics, and paper.

According to the FGS, Florida producers supplied approximately 25% of the world's phosphate needs and 75% of U.S. domestic needs. Based upon FGS surveys and estimates, approximately 34 million metric tons of phosphate rock was mined in the State in 1999, nearly all of which was used to manufacture agricultural fertilizer. The remainder was used in products such as feed supplements, vitamins, soft drinks, and toothpaste. In 1998, \$1.8 billion worth of fertilizer was exported, making it one of Florida's leading export commodities.

Phosphate companies actively mining in the State included the IMC-Agrico Co., Cargill Fertilizer, Inc., CF Industries, Inc., Agrifos, L.L.C., Potash Corporation of Saskatchewan, and Nu-Gulf Industries, Inc. Farmland Hydro, L.P. planned to apply to open a new mine in Hardee County.

Mulberry Corp.'s Piney Point phosphate plant (formerly owned by Royster Phosphates, Inc.) in North Manatee County was reopened in August, employing about 170 people, but closed again in October because of challenges from environmental groups. All Mulberry plants were closed in December.

For IMC-Agrico, 1999 was a very busy year. It applied to open two new mines, Ona and Pine Level, but shut down several operations. IMC-Agrico permanently closed the Payne Creek and Noralyn-Clear Springs Mines. Near the end of 1999, the company also planned to close some plants in central Florida and Louisiana to cut output by more than 20% because of "a global fertilizer glut." IMC-Agrico announced that it planned to close its Nichols chemical plant east of Tampa (74 workers). The company planned to cease production of triple superphosphate, one of three major crop nutrients, at its New Wales chemical plant. Mine shutdowns also occurred at Cargill's Ft. Meade Mine (several weeks) and at Nu-Gulf's Wingate Creek Mine (News-Journal online, November 14, 1999, Nation's largest phosphate company to close mines, plants, accessed June 15, 2000, at URL <http://www.n-jcenter.com/1999/Nov/14/>). IMC-Agrico received conceptual approval for a 69-hectare (ha) expansion at its Four Corners Mine near Duette. The project was on hold because of problems with the county government and consultants' reports. Opposition from the State delayed the company's planned expansion of about 1,140 ha at its Ft. Green Mine near Duette (Herald Tribune News Coast, September 3, 1999, State opposes Manatee Mine expansion, accessed June 15, 2000, at URL <http://www.newscoast.com>).

In the peat sector, the Hyponex Co. announced plans to mine approximately 53 ha of South Lake County marshland (Orlando Sentinel, 1999). American Peat, Inc. was preparing an ERP application for the Loper Peat Mine in Madison County, formerly operated by W.C. Loper.

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- 1999c, Lafarge to build new wallboard production facility in Florida: North American Quarry News, October, v. 1, p. 15-16.
- Orlando Sentinel, 1999, Mine may turn muck to bucks: Orlando Sentinel, September 8, p. 2.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN FLORIDA 1/ 2/

(Thousand metric tons and thousand dollars)

Mineral	1997		1998		1999 p/	
	Quantity	Value	Quantity	Value	Quantit	Value
Cement:						
Masonry	406	36,200 e/	442	40,600 e/	454	42,000 e/
Portland	3,750	274,000 e/	3,470	259,000 e/	3,560	265,000 e/
Gemstones	NA	1	NA	1	NA	1
Peat	361	5,710	391	7,360	354	7,920
Sand and gravel:						
Construction	19,200	75,500	20,900	84,600	23,500	96,700
Industrial	507	5,800	525	6,150	516	6,410
Stone: Crushed 3/	73,600 r/	394,000 r/	81,000	377,000	85,800	409,000
Combined values of clays (common, fuller's earth, kaolin), magnesium compounds, phosphate rock, staurolite, stone (crushed marl), titanium concentrates, zirconium concentrates and values	XX	1,040,000	XX	1,030,000	XX	1,100,000
Total	XX	1,830,000	XX	1,810,000	XX	1,930,000

e/ Estimated. p/ Preliminary. r/ Revised. NA Not available. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to no more than three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
FLORIDA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of Quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	70 r/	70,400 r/	\$376,000 r/	\$5.3 r/	91	76,600	\$351,000	\$4.15
Limestone-dolomite	2	W	W	5.74	2	W	W	7.62
Dolomite	4	W	W	6.42	4	W	W	5.78
Calcareous marl	1	(2/)	(2/)	(2/)	1	(2/)	(2/)	(2/)
Sandstone	--	--	--	--	1	W	W	4.00
Shell	4	W	W	4.61	6	1,950	7,940	3.70
Total or average	XX	73,600 r/	394,000 r/	5.36 r/	XX	81,000	377,000	4.65

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable. -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Excluded from total to avoid disclosing company proprietary data.

TABLE 3
FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 1998, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	94	\$719	\$7.65
Filter stone	106	776	7.32
Other coarse aggregate	66	407	6.17
Coarse aggregate, graded:			
Concrete aggregate, coarse	6,590	43,700	6.63
Bituminous aggregate, coarse	3,000	17,100	5.69
Other graded coarse aggregate	1,740	10,200	5.90
Fine aggregate (-3/8 inch):			
Stone sand, concrete	2,200	12,000	5.45
Stone sand, bituminous mix or seal	1,660	8,730	5.27
Screening, undesignated	2,740	11,200	4.09
Other fine aggregate	2,320	12,000	5.16
Coarse and fine aggregates:			
Graded road base or subbase	13,600	50,200	3.69
Unpaved road surfacing	W	W	3.57
Crusher run or fill or waste	3,860	13,700	3.56
Other coarse and fine aggregates	1,600	6,140	3.80
Other construction materials	5,070	21,900	4.32
Agricultural:			
Agricultural limestone	438	2,680	6.11
Poultry grit and mineral food	W	W	19.94
Other agricultural uses	377	3,800	10.09
Chemical and metallurgical:			
Cement manufacture	3,440	13,200	3.83
Glass manufacture	W	W	9.89
Special:			
Asphalt fillers or extenders	W	W	12.97
Other fillers or extenders	77	426	5.54
Other miscellaneous uses: Other specified uses not listed	282	3,910	13.87
Unspecified: 3/			
Actual	23,500	105,000	4.46
Estimated	8,050	36,300	4.51
Total or average	81,000	377,000	4.65

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, limestone, limestone-dolomite, and shell; excludes calcareous marl from total to avoid disclosing company proprietary data.

3/ Reported and estimated production without a breakdown by end use.

TABLE 4
FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1998,
BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	W	W	W	W	44	214	174	1,100
Coarse aggregate, graded 4/	W	W	W	W	5,010	37,600	5,780	28,100
Fine aggregate (-3/8 inch) 5/	W	W	W	W	4,040	19,100	4,650	23,400
Coarse and fine aggregate 6/	955	4,980	8,200	28,300	3,770	15,100	6,160	21,700
Other construction materials	381	3,540	449	3,800	--	--	5,070	21,900
Agricultural 7/	196	1,400	(8/)	(8/)	327	1,630	--	--
Chemical and metallurgical 9/	--	--	(8/)	(8/)	(8/)	(8/)	(8/)	(8/)
Special 10/	--	--	(8/)	(8/)	(8/)	(8/)	--	--
Other miscellaneous uses	--	--	(8/)	(8/)	--	--	(8/)	(8/)
Unspecified: 11/								
Actual	502	1,660	564	1,860	5,460	26,500	16,900	74,700
Estimated	677	3,090	1,080	5,230	1,500	7,260	4,800	20,700
Total	2,710	14,700	11,100	49,100	22,500	116,000	44,800	196,000

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Excludes calcareous marl from total to avoid disclosing company proprietary data.

3/ Includes filter stone, riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

7/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes cement manufacture and glass manufacture.

10/ Includes asphalt fillers or extenders and other fillers or extenders.

11/ Reported and estimated production without a breakdown by end use.

TABLE 5
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998,
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate and concrete products	8,380	\$38,200	\$4.56
Plaster and gunite sands	480	2,060	4.29
Asphaltic concrete aggregates and road base materials 2/	693	2,320	3.34
Fill	2,560	5,910	2.31
Other miscellaneous uses	W	W	4.09
Filtration	W	W	4.94
Unspecified: 3/			
Actual	4,880	20,800	4.28
Estimated	3,300	12,300	3.72
Total or average	20,900	84,600	4.04

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (lime).

3/ Reported and estimated production without a breakdown by end use.

TABLE 6
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1998,
BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	788	3,080	6,530	30,200
Asphaltic concrete aggregates and road base materials 3/	W	W	W	W
Fill	634	770	W	W
Other miscellaneous uses	W	W	W	W
Filtration	--	--	W	W
Unspecified: 4/				
Actual	W	W	258	1,010
Estimated	606	2,430	1,930	7,370
Total	2,370	9,060	9,470	41,500
	District 3		District 4	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	1,540	7,040	2	5
Asphaltic concrete aggregates and road base materials 3/	139	463	286	1,040
Fill	956	2,350	W	W
Other miscellaneous uses	W	W	--	--
Filtration	W	W	--	--
Unspecified: 4/				
Actual	4,050	16,100	W	W
Estimated	760	2,480	--	--
Total	7,940	30,400	1,140	3,560

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.

1/ Data are rounded to no more than three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement and lime).

4/ Reported and estimated production without a breakdown by end use.

THE MINERAL INDUSTRY OF FLORIDA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Florida Geological Survey for collecting information on all nonfuel minerals.

In 1998, the preliminary estimated value¹ of nonfuel mineral production for Florida was about \$1.96 billion, according to the U.S. Geological Survey (USGS). This value, the highest nonfuel mineral value reported in the State's history, was a 7% increase from that of 1997,² and followed a 4% increase in 1997 from 1996. The increase continued an upward trend that began in 1994, following 5 years of lowering values. For the third consecutive year, Florida ranked fourth among the 50 States in total nonfuel mineral production value, of which the State accounted for almost 5% of the U.S. total.

Florida continued to be the Nation's leading phosphate rock-mining State in 1998, producing nearly seven times the quantity of material as that of the next-highest State. Phosphate rock is only produced in four States. In terms of value, phosphate rock, crushed stone, and portland cement continued to be the most important minerals produced in Florida. In 1998, increases of \$53 million in the value of crushed stone, \$44 million in phosphate rock, and \$16 million in portland cement led the State's increase in value (table 1). This was further supported by smaller increases in construction sand and gravel, zircon concentrates, rutile, masonry cement, and peat, in descending order of net increase. Values of production for all other mineral commodities also increased except for staurolite and kaolin, which showed small decreases, and gemstones, which remained unchanged.

Likewise, in 1997, most of Florida's nonfuel mineral commodities increased in value, led by portland cement up \$29 million (up nearly 12%), zircon concentrates up \$15.5 million, phosphate rock almost \$10 million, and construction sand and gravel up \$6.7 million (almost 10%).

Based on USGS preliminary estimates of the quantities produced in the 50 States in 1998, Florida remained the only² State to produce rutile and staurolite. It ranked first in peat and tied for first in masonry cement; third in fuller's earth and

crushed stone; fourth in magnesium compounds; and seventh in portland cement. Florida ranked the first of three titanium-producing States and the first of two States in zirconium concentrates. Additionally, Florida produced substantial quantities of construction and industrial sand and gravel.

The Florida Geological Survey³ provided the following narrative information. Common clay is extracted from many localities in Florida. Fuller's earth is Florida's number one clay commodity because it surpasses both of Florida's other two clay types, common clay and kaolin, in total quantity produced and total mineral production value. Fuller's earth, in the form of palygorskite (attapulgite), is mined by the Engelhard Corp. and the Milwhite Co. in Gadsden County, and, in the form of montmorillonite, is mined by MFM Industries, Inc. in Marion County. Kaolin is mined by the Feldspar Corp. in Putnam County.

The principal use of the heavy minerals in Florida remains the manufacture of titanium dioxide pigments. RGC (USA) Mineral Sands, Inc. (RGC) and E.I. du Pont de Nemours and Co., Inc. remain the only heavy mineral producers in the State. In 1997, RGC began mining operations in Putnam County.

Florida's phosphate producers supply approximately 25% of the world's and 75% of the Nation's phosphate needs. As such, it is Florida's largest industrial mineral commodity in terms of quantity produced and production value. Companies that actively mined phosphate during 1998 include IMC-Agrico Co., Cargill Fertilizer, Inc., CF Industries, Inc., Potash Corp. of Saskatchewan and Agrifos L.L.C. NuGulf Industries reopened its mine in late November. IMC-Agrico announced the temporary shut down of the Kingsford and Payne Creek Mines and the Clear Springs and Noralyn Mines will be closed permanently in mid-1999.

IMC-Agrico Co. and Farmland Hydro LP are currently trying to get approval to mine on about 25,000 hectares in DeSoto, Hardee, and Manatee Counties. This region falls into the Peace River Basin.

Florida Rock Industries (FRI) has received permits that will allow them to complete construction of its cement plant at Newberry, FL. Nearby, in the Branford area, the Suwannee American Cement Co., a subsidiary of Anderson-Columbia Co., has applied for air permits for a new cement plant. If both companies begin production it would bring the total number of cement plants in Florida to six (Matus, 1998).

E.R. Jahna Industries is now in the permitting phase on a proposed sand mine in northern Polk County.

Limestone (CaCO_3), the primary source of stone in Florida and one with large reserves, is mined in many localities. Much of the limestone is crushed and used as base course material or as small aggregate in road building. The larger size limestone aggregates are becoming a limited resource in the State.

³Steven Spencer, Coastal/Economic Geologist, authored the text submitted by the Florida Geological Survey.

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1998 USGS mineral production data published in this chapter are preliminary estimates as of February 1999 and are expected to change. For some mineral commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at <http://minerals.usgs.gov/minerals/contacts/comdir.html>; by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists); or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at <http://minerals.usgs.gov/minerals>; facsimile copies may be obtained from MINES FaxBack.

²Values, percentage calculations, and rankings for 1997 may vary from the *Minerals Yearbook, Area Reports: Domestic 1997, Volume II*, owing to the revision of preliminary 1997 to final 1997 data. Data for 1998 are preliminary and expected to change, while related rankings may also be subject to change.

FRI's request for a 10-year extension to its mining lease in the Withlachoochee State Forest was turned down in 1998 by the U.S. Forest Service (USFS). FRI was first issued a mining lease by the USFS in 1965. The action by the USFS brings limestone mining in the Withlachoochee State Forest to an end (Hollingsworth, 1998).

The Quality Control 2000 program for qualifying laboratories and training technicians who sample and test aggregates, asphalt, concrete, and earthwork is moving forward on schedule. This program is a result of the Federal Highway Administration's mandate that all State's Departments of Transportation have Quality Assurance Procedures for Construction in place by June 30, 2000. The University of Florida is acting as coordinator for the Florida Department of Transportation in developing and administering the program.

The Florida Minerals Association (FMA) was established by several Florida mining companies in 1997 to provide leadership and to advance and encourage responsible development of the mineral industry in the State. The FMA generally focuses on legislation and regulation, the environment, public safety and health, and land use issues. The association is in the process of selecting a director and building an internet web page.

The Department of Environmental Protection's (DEP) Bureau of Mine Regulation (BOMR) administers the State's reclamation rules, which are found in the Florida

Administrative Code and which are authorized by Chapter 373 of the Florida Statutes. The BOMR regulates the permitting of mines that are located on lands over which the DEP has jurisdiction through DEP's dredge and fill and environmental resource permitting rules. The BOMR also regulates the design, construction, and maintenance of phosphogypsum recovery stack systems.

In 1998, the BOMR coordinated the National Association of State Land Reclamationists conference, where several mines were recognized with awards for their reclamation efforts. The BOMR published a document recently that outlines an integrated habitat network for the Florida phosphate district (Jim Price, FDEP-BOMR, written commun., 1999).

Miami-Dade Lake Belt Plan legislation was vetoed in the 1998 legislature. The veto took place not because of the plan itself, but rather because of another provision that was attached to the bill. The bill will be reintroduced into the 1999 legislature. The plan integrates mining operations with other land uses. The plan calls for operators to contribute to a trust fund that will, in turn, handle all wetlands mitigation. Federal, State, and local permitting and reclamation will be consolidated at the county level.

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Matus, Ron, 1998, Cement plant is approved: Gainesville Sun, December 17, p. 1B and 3B.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN FLORIDA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1996		1997		1998 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	422	35.200 e/	406	36.200 e/	413	38.100
Portland	3,450	245.000 e/	3,750	274.000 e/	3,880	290.000
Clays:						
Fuller's earth	377	58.900	W	W	W	W
Kaolin	35	3.760	W	W	W	W
Gemstones	NA	1	NA	1	NA	1
Peat	298	5.550	361	5.710	263	7.160
Sand and gravel:						
Construction	18,500	68.800	19,200	75.500	20,100	81.200
Industrial	515	6.340	507	5.800	536	6.220
Stone: Crushed 3/	73,600	394.000	73,800	396.000	81,700	449.000
Combined values of clays (common), magnesium compounds, phosphate rock, staurolite, stone [crushed marl (1996-97)], titanium concentrates, zirconium concentrates, and values indicated by symbol W	XX	947,000	XX	1,040,000	XX	1,090,000
Total	XX	1,760,000	XX	1,830,000	XX	1,960,000

e/ Estimated. p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
FLORIDA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1996				1997			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of Quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	76 2/	71.000 2/	\$379.000 2/	\$5.34 2/	73 2/	71.600 2/	\$384.000 2/	\$5.37 2/
Dolomite	4	W	W	6.55	4	W	W	6.42
Shell	4	W	W	4.46	4	W	W	4.61
Calcareous marl	2	(3/)	(3/)	(3/)	1	(3/)	(3/)	(3/)
Total	XX	73.600	394.000	5.35	XX	73.800	396.000	5.37

W Withheld to avoid disclosing company proprietary data: included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes "limestone-dolomite" reported with no distinction between the two.

3/ Excludes calcareous marl from State total to avoid disclosing company proprietary data.

TABLE 3
FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 1997, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	3.530	\$4.560	\$1.29
Other coarse aggregate 3/	30	240	8.00
Coarse aggregate, graded:			
Concrete aggregate, coarse	5.750	36.100	6.27
Bituminous aggregate, coarse	2.860	15.700	5.49
Other graded coarse aggregate 4/	1.710	12.900	7.55
Fine aggregate (-3/8 inch):			
Stone sand, concrete	1.690	9.530	5.64
Stone sand, bituminous mix or seal	2.120	9.980	4.71
Screening, undesignated	2.380	8.020	3.36
Other fine aggregates	1.560	9.220	5.92
Coarse and fine aggregates:			
Graded road base or subbase	13.900	44.000	3.16
Unpaved road surfacing	307	1.430	4.64
Crusher run or fill or waste	3.550	10.200	2.88
Other coarse and fine aggregates	430	3.260	7.58
Other construction materials	2	10	5.00
Agricultural:			
Agricultural limestone	485	3.070	6.33
Other agricultural uses	200	885	4.43
Chemical and metallurgical, cement manufacture	W	W	1.45
Special, other specified uses not listed	W	W	2.24
Unspecified: 5/			
Actual	27.500	204.000	7.39
Estimated	3.670	20.800	5.66
Total	73.800	396.000	5.37

W Withheld to avoid disclosing company proprietary data: included in "Total."

1/ Includes dolomite, limestone, limestone-dolomite, and shell; excludes calcareous marl from State to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone.

4/ Includes railroad ballast.

5/ Includes reported and estimated production without a breakdown by end use.

TABLE 4
FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1997,
BY USE AND DISTRICT 1/ 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 3/	W	W	W	W	W	W	W	W
Coarse aggregate, graded 4/	W	W	W	W	4.950	34.400	4.660	22.500
Fine aggregate (-3/8 inch) 5/	W	W	W	W	4.120	18.700	3.370	16.100
Coarse and fine aggregate 6/	W	W	6.790	21.800	2.990	11.300	7.530	19.600
Other construction materials	--	--	W	W	--	--	--	--
Agricultural 7/	221	1,520	W	W	347	2,120	--	--
Chemical and metallurgical 8/	--	--	--	--	W	W	--	--
Other miscellaneous uses 9/	--	--	W	W	--	--	--	--
Unspecified: 10/								
Actual	W	W	W	W	W	W	W	W
Estimated	--	--	1.150	6.870	848	4.820	W	W
Total	2,340	16,500	9,130	36,600	22,000	129,000	40,400	214,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Excludes calcareous marl from State to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone and riprap and jetty stone, and other coarse aggregate.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

7/ Includes agricultural limestone, and other agricultural uses.

8/ Includes cement manufacture.

9/ Includes other specified uses not listed.

10/ Includes reported and estimated production without a breakdown by end use.

TABLE 5
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1997,
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	5.720	\$24.500	\$4.28
Plaster and gunite sands	774	3.000	3.87
Concrete products (blocks, bricks, pipe, decorative, etc.)	533	2.980	5.59
Asphaltic concrete aggregates and other bituminous mixtures	365	1.370	3.75
Road base and coverings 2/	710	3.500	4.93
Fill	2.350	5.560	2.37
Other miscellaneous uses 3/	1.020	4.810	4.72
Unspecified: 4/			
Actual	3.910	17.400	4.44
Estimated	3.840	12.400	3.22
Total or average	19.200	75.500	3.93

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (lime).

3/ Includes filtration.

4/ Includes reported and estimated production without a breakdown by end use.

TABLE 6
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1997,
BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	695	2.770	W	W
Asphaltic concrete aggregates and road base materials 3/	W	W	608	3.040
Other miscellaneous uses 4/	835	2.920	6,500	29.000
Unspecified: 5/				
Actual	W	W	W	W
Estimated	1.100	3.970	1.640	4.990
Total	2.630	9.650	8.750	37.100
	District 3		District 4	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	1.330	5.900	(6/)	(6/)
Asphaltic concrete aggregates and road base materials 3/	1.440	4.600	(6/)	(6/)
Other miscellaneous uses 4/	2.280	8.610	--	--
Unspecified: 5/				
Actual	2.090	8.120	--	--
Estimated	1.100	3.430	--	--
Total	6.800	26.100	1.050	2.690

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes fill and road and other stabilization (lime).

4/ Includes filtration.

5/ Includes reported and estimated production without a breakdown by end use.

6/ Withheld to avoid disclosing company proprietary data; included in "Total."

THE MINERAL INDUSTRY OF FLORIDA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Florida Geological Survey for collecting information on all nonfuel minerals.

Florida ranked sixth among the 50 States in total nonfuel mineral production value¹ in 1997, according to the U.S. Geological Survey (USGS). The State was fourth in 1996. The estimated value for 1997 was more than \$1.7 billion, a 1% decrease from that of 1996. This followed a 14% increase from 1995 to 1996 (based on final 1996 data). The State accounted for almost 4.5% of the U.S. total nonfuel mineral production value.

Florida continued to be the Nation's leading phosphate rock-mining State in 1997, producing more than five times the quantity of material as that of the next-highest State. Phosphate rock is only produced in four States. In terms of value, phosphate rock, crushed stone, and portland cement continued to be the most important minerals produced in Florida. In 1997, significant increases in the values of portland cement, construction sand and gravel, and phosphate rock moderated but did not overcome decreases in fuller's earth and crushed stone (*see table 1*), resulting in the State's small drop in nonfuel mineral value from that of 1996. In 1996, most of the State's nonfuel mineral commodities increased in value, led by phosphate rock, which increased nearly 18% (more than \$100 million), compared with that of 1995. The other leading nonfuel mineral commodities in 1996, in descending order of net increase, were crushed stone, zircon concentrates, portland cement, ilmenite, fuller's earth, and rutile. Only construction sand and gravel showed a small decrease.

Based on USGS estimates of quantities produced in the 50 States during 1997, Florida remained the only State to produce zircon concentrates, rutile, and staurolite; first in peat and masonry cement, first of 2 ilmenite-producing States (as well as the major U.S. producer), and seventh in portland cement. The State rose to second from third in fuller's earth, to third from fourth in magnesium compounds, and dropped from third to fourth in crushed stone. Additionally, Florida produced significant quantities of construction sand and gravel.

The following narrative information was provided by the

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1997 USGS mineral production data published in this chapter are estimates as of January 1998. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: <http://minerals.er.usgs.gov/minerals/contacts/comdir.html>. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved by way of MINES FaxBack or over the Internet at <http://minerals.er.usgs.gov/minerals/>.

Florida Geological Survey² (FGS). Common clay is extracted in small quantities from many localities in Florida. Kaolin is mined in Putnam County at the Feldspar Corp. Mine. Fuller's earth, in the form of attapulgite (palygorskite), is extracted in the Gadsden County area of northwest Florida and montmorillonite-type fuller's earth in north-central Florida in Marion County. The attapulgite-type fuller's earth is most often recognized as Florida's primary clay commodity. During the past year the Engelhard Corp. purchased the Floridin Co. and is operating the Quincy Mine, which was formerly operated by Floridin.

Heavy minerals produced in Florida are used in the manufacture of titanium dioxide pigments. RGC (USA) Mineral Sands, Inc. (RGC), and E.I. du Pont de Nemours & Co. Inc., are the only heavy mineral producers in the State. This past year, RGC received an Environmental Resource Permit (ERP) for a satellite mine. RGC will conduct operations without the use of a suction dredge and a floating wet-mill concentrator, and instead will use traditional earth-moving equipment. The sand will be concentrated at a land-based concentrator at the mine site.

Florida's phosphate operations supply approximately 25% of the world's and 75% of the Nation's phosphate needs. Phosphate rock is the State's largest industrial mineral commodity in terms of quantity mined and value. Companies presently mining in Florida include IMC-Agrico Co., Cargill Fertilizer, Inc., CF Industries, Inc., Potash Corp. of Saskatchewan (PSC), and Agrifos L.L.C. Neither Farmland Industries, Inc. nor Nu-Gulf Industries were actively mined in 1997; however, Farmland is just about to enter into the permitting phase for a new mine. IMC-Agrico also is working on permits for two new mines, permits must be obtained before any mining is allowed.

Limestone, the primary source of stone, is mined in many localities in the State. During the past year, Florida Rock Industries, Inc. (FRI) acquired permission to mine at the Florida Aggregates Inter-Group Mine in St. Lucie County. FRI is now in the process of getting the proper permits. Construction has begun on FRI's new cement mill in western Alachua County. It is anticipated that the mill will be brought on-line in 18 months.

Florida Limerock and Aggregates Institute (FLAI), which acts as the voice of the Florida aggregate industry, continues to work closely with the Florida Department of Transportation as they implement both "Superpave," a new asphalt mix design concept, and Quality Control 2000, a quality control/quality assurance program to improve the quality of construction for the State and federal highway system. Many of the aggregate producers are members of the FLAI.

The Department of Environmental Protection's (DEP) Bureau of Mine Regulation (BOMR) administers the State's reclamation

²Steven Spencer, Coastal/Economic Geologist, authored the text submitted by the Florida Geological Survey.

rules. The rules, which are spelled out in the Florida Administrative Code, give the BOMR authority to regulate individual operators in their reclamation efforts. There is no statewide mining law covering all commodities.

The BOMR transferred the ERP and reclamation programs for mines within the Southwest district to the DEP Southwest District

Office. These programs cover clay, limestone, peat, sand and gravel, and shell and dolomite operations. The only mines in the district that are still under the jurisdiction of BOMR are those mines where operators have other mines in other DEP districts or, where their mines cross into neighboring districts.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN FLORIDA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1995		1996		1997 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	383	35,200	422	35,200 e/	431	36,600 e/
Portland	3,170	233,000	3,450	245,000 e/	3,510	255,000 e/
Clays:						
Fuller's earth	388	50,800	377	58,900	430	41,900
Kaolin	33	3,510	35	3,760	35	3,770
Gemstones	NA	W	NA	1	NA	1
Peat	294	5,390	298	5,550	244	4,690
Sand and gravel:						
Construction	19,300	69,300	18,500	68,800	19,300	73,500
Industrial	547	6,340	515	6,340	515	6,330
Stone, crushed	68,000	350,000	73,600 3/	394,000 3/	70,200 3/	380,000 3/
Combined value of clays (common), magnesium compounds, phosphate rock, staurolite, stone [crushed marl (1996-97)], titanium concentrates, zirconium concentrates, and value indicated by symbol W	XX	783,000	XX	947,000	XX	943,000
Total	XX	1,540,000	XX	1,760,000	XX	1,740,000

e/ Estimated. p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
FLORIDA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1995				1996			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	75 r/	64,200 r/	\$329,000 r/	\$5.12 r/	76 2/	71,000 2/	\$379,000 2/	\$5.34 2/
Limestone-dolomite	2	W	W	7.06	—	—	—	—
Dolomite	4	1,120	7,010	6.28	4	W	W	6.55
Shell	5	1,090	4,100	3.78	4	W	W	4.46
Calcareous marl	2	W	W	4.53	(3/)	(3/)	(3/)	(3/)
Total	XX	68,000	350,000	5.14	XX	73,600	394,000	5.35

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes "Limestone-dolomite," reported with no distinction between the two.

3/ Excludes calcareous marl from State total to avoid disclosing company proprietary data.

TABLE 3
FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 1996, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	274	\$1,620	\$5.89
Filter stone	361	1,900	5.26
Coarse aggregate, graded:			
Concrete aggregate, coarse	12,400	86,800	7.02
Bituminous aggregate, coarse	5,580	36,500	6.54
Bituminous surface-treatment aggregate	309	2,650	8.59
Other graded coarse aggregate 3/	994	6,530	6.57
Fine aggregate (-3/8 inch):			
Stone sand, concrete	6,080	42,900	7.04
Stone sand, bituminous mix or seal	3,120	19,300	6.18
Screening, undesignated	2,600	9,630	3.70
Other fine aggregates	1,330	7,480	5.64
Coarse and fine aggregates:			
Graded road base or subbase	17,100	67,500	3.94
Unpaved road surfacing	420	1,860	4.43
Crusher run or fill or waste	4,300	15,700	3.67
Other coarse and fine aggregates	2,040	6,080	2.98
Other construction materials 4/	284	1,320	4.64
Agricultural limestone 5/	816	4,600	5.63
Chemical and metallurgical, cement manufacture	3,220	9,160	2.84
Special:			
Other fillers or extenders	W	W	5.51
Other specified uses not listed	W	W	9.06
Unspecified: 6/			
Actual	8,050	48,100	5.98
Estimated	4,360	24,000	5.51
Total	73,600	394,000	5.35

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Includes dolomite, limestone, limestone-dolomite, and shell; excludes calcareous marl from State to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes railroad ballast.

4/ Includes pipe bedding.

5/ Includes poultry grit and mineral food and other agricultural uses.

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 4
FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1996,
BY USE AND DISTRICT 1/ 2/ 3/

(Thousand metric tons and thousand dollars)

Use	District 3		District 4	
	Quantity	Value	Quantity	Value
Construction aggregates:				
Coarse aggregate (+1 1/2 inch) 4/	99	727	536	2,790
Coarse aggregate, graded 5/	5,570	40,400	13,700	92,100
Fine aggregate (-3/8 inch) 6/	3,930	19,400	9,200	59,800
Coarse and fine aggregate 7/	10,700	36,100	13,200	55,000
Other construction materials 8/	75	738	209	579
Agricultural 9/	816	4,600	--	--
Chemical and metallurgical 10/	W	W	W	W
Special 11/	W	W	--	--
Other miscellaneous uses 12/	W	W	--	--
Unspecified: 13/				
Actual	W	W	W	W
Estimated	2,260	12,900	2,090	11,200
Total	31,800	159,000	41,800	235,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Excludes calcareous marl from State total to avoid disclosing company proprietary data.

2/ Production reported in District 1 and District 2 was included with "District 3" to avoid disclosing company proprietary data.

3/ Data are rounded to three significant digits; may not add to totals shown.

4/ Includes filter stone and riprap and jetty stone.

5/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

6/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesigned), and other fine aggregate.

7/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

8/ Includes pipe bedding.

9/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

10/ Includes cement manufacture.

11/ Includes other fillers or extenders.

12/ Includes other specified uses not listed.

13/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1996,
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	7,410	\$30,900	\$4.17
Plaster and gunite sands	694	2,480	3.57
Concrete products (blocks, bricks, pipe, decorative, etc.)	529	2,630	4.97
Asphaltic concrete aggregates and other bituminous mixtures	405	1,400	3.46
Road base and coverings 2/	793	4,740	5.97
Fill	1,930	3,390	1.76
Other miscellaneous uses 3/	520	2,160	4.15
Unspecified: 4/			
Actual	2,150	9,260	4.30
Estimated	4,050	11,800	2.91
Total or average	18,500	68,800	3.72

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes fill and road and other stabilization (cement and lime).

3/ Includes filtration.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1996,
BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	952	3,340	W	W	W	W	254	560
Asphaltic concrete aggregates and road base materials 3/	871	1,360	W	W	W	W	373	551
Other miscellaneous uses 4/	4	8	7,220	32,400	2,600	9,570	--	--
Unspecified: 5/								
Actual	246	2,290	--	--	1,910	6,970	--	--
Estimated	807	2,400	1,520	4,620	1,020	3,300	711	1,460
Total	2,880	9,400	8,740	37,000	5,520	19,800	1,340	2,570

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes fill and road and other stabilization (cement and lime).

4/ Includes filtration.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

THE MINERAL INDUSTRY OF FLORIDA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Bureau of Mines, U.S. Department of the Interior, and the Florida Department of Mines and Mineral Resources for collecting information on all nonfuel minerals.

Florida ranked eighth among the 50 States in total nonfuel mineral production value¹ in 1996, according to the U.S. Geological Survey (USGS). This is a decline from seventh place in 1995. The estimated value for 1996 was more than \$1.5 billion; though slightly up from 1995, the value was virtually unchanged. This followed a more than 12% increase in 1995 from 1994 (based on final 1995 data). The State accounted for about 4% of the U.S. total nonfuel mineral production value.

Florida continued to be the Nation's leading phosphate rock-mining State in 1995, producing more than six times the quantity of material as that of the next-highest State. Phosphate rock is only produced in four States. The phosphate rock industry usually has the most impact on the State's raw nonfuel mineral economy. Other mineral commodities that commonly have a significant effect on Florida's overall nonfuel mineral production value are crushed stone and portland cement. In 1996, most of the State's nonfuel mineral commodities increased in value. Their combined total increased slightly more than equaled an 8.4% decrease in phosphate rock value. Only phosphate rock decreased in value. Compared with 1995, increases in zircon concentrate, crushed stone, and construction sand and gravel values accounted for 81% of nonfuel mineral commodity value gains for 1996. Other values that increased in 1996 were those for portland cement, fuller's earth clays, titanium concentrates (both ilmenite and rutile), masonry cement, magnesium compounds, industrial sand and gravel, peat, staurolite, and kaolin clays. This followed a strong year in 1995 for the Florida mining industry when, similarly, nearly all mineral commodities increased in value. Phosphate rock then lead the way with a 17.5% increase over the 1994 value. Moderate increases occurred in construction sand and gravel, titanium concentrates, crushed stone, portland cement, and magnesium compounds in 1995.

Overall in 1996, Florida's mining industry maintained its rebound in nonfuel mineral production value which had begun in 1994. Since reaching the State's second alltime high of \$1.61 billion in 1989, the State's mineral value had been on a downward trend. This culminated in the 9% drop to \$1.31 billion from 1992 to 1993; declining phosphate rock value was the principal contributor. Most other mineral commodities in 1993 increased. In 1994, the increased values of phosphate rock, crushed stone, and portland and masonry cements were principally responsible for the year's turnaround in mineral value.

Florida, almost exclusively an industrial-mineral-producing State, remained first in the quantity of peat produced, second in fuller's earth and magnesium compounds, third in crushed stone, and seventh in portland cement (all 1996 rankings are based on USGS-estimated data). The State climbed from third to first in the production of masonry cement, and Florida was the only State to produce zircon concentrates, staurolite, and ilmenite and rutile concentrates (titanium ores). Additionally, Florida mining pits produced significant quantities of construction sand and gravel.

The following narrative information was provided by the Florida Geological Survey² (FGS). The Florida Legislature passed a statute in 1996 that enabled the FGS to compile and hold (protect) proprietary data pertaining to Florida's mineral operations. This will allow the FGS to more fully participate with the USGS in its mineral industry information program.

The phosphate industry was dominated by IMC-Agrico Co. having mines and processing plants located in Hardee, Hillsborough, Manatee, and Polk Counties. Other companies engaged in phosphate mining in the State in 1996 included: Cargill Fertilizer, Inc. operations in Hardee and Polk Counties; C.F. Mining Corp., Hardee County; NU-Gulf, Inc., Manatee County; and PCS Phosphate Co., Hamilton County. PCS Phosphate's Hamilton County operation was formerly the White Springs operation of Occidental Chemical Agricultural Products Inc.

The Florida Limerock and Aggregates Institute (FLAI) represents a number of limestone operators in Florida. The Institute is an autonomous division of the Florida Concrete Products Association, with which it merged several years ago. The primary focus of the FLAI is to pursue promotional, technical, and regulatory matters of concern to the aggregates industry. The Florida aggregates industry is working closely with the Florida Department of Transportation (FDOT) to address technical issues, especially the quality of source materials and the end uses of those materials. The two organizations are working together to improve the effectiveness of the quality assurance program used to control aggregate quality in the State. Of late, one of their primary concerns has been the use of recycled asphalt pavement as an aggregate component of hot-asphalt mix. FDOT focused on improving the performance of asphalt pavements.

A second important issue for the limestone industry

product passing through multiple terminals, may serve to introduce more degradation of the physical characteristics of the aggregate product.

E. I. du Pont de Nemours & Co. Inc. planned to mine heavy minerals along the eastern edge of the Okefenokee Swamp. But the mining will occur over the border in Georgia and therefore, theoretically at least, should not directly affect Florida.

There were 10 peat mines in Florida. One of those, Stover Peat Co. near Tampa, was idle. The company currently has no plans to resume mining.

¹The terms "nonfuel mineral production" and related "values"

encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1996 USGS mineral production data published in this chapter are estimates as of February 1997. For some commodities, e.g., construction sand and gravel, crushed stone, and portland cement, estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at: <http://minerals.er.usgs.gov/minerals/contacts/comdir.html>.

²Steven Spencer, Coastal/Economic Geologist, authored the text submitted by the Florida Geological Survey.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN FLORIDA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1994		1995		1996 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	400	34,600	383	35,200	418	38,300
Portland	3,370	228,000	3,170	233,000	3,210	236,000
Clays 3/	430	55,000	421	54,300	433	55,900
Gemstones	NA	W	NA	W	NA	1
Peat	206	3,230	294 4/	5,390 4/	288 4/	6,200 4/
Sand and gravel:						
Construction	16,600	60,700	19,300	69,300	20,500	76,700
Industrial	540	6,120	547	6,340	535	6,590
Stone (crushed)	66,300 5/	343,000	68,000	350,000	70,000	368,000
Combined value of clays (common), magnesium compounds, phosphate rock, rare-earth metal concentrates (1994), staurolite, titanium concentrates (ilmenite and rutile), zircon concentrates, and values indicated by symbol W	XX	669,000	XX	783,000	XX	749,000
Total	XX	1,400,000	XX	1,540,000	XX	1,540,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain clays; kind and value included with "Combined value" data.

4/ Data series changed to production beginning in 1995, prior years shipment data may not be comparable.

5/ Excludes certain stones; kind and value included with "Combined value" data.

TABLE 2
FLORIDA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS
IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	96	\$591	\$6.16
Filter stone	11	120	10.90
Coarse aggregate, graded:			
Concrete aggregate, coarse	7,740	58,000	7.49
Bituminous aggregate, coarse	2,480	13,300	5.36
Bituminous surface-treatment aggregate	W	W	10.50
Railroad ballast	W	W	4.18
Other graded coarse aggregate	793	4,830	6.09
Fine aggregate (-3/8 inch):			
Stone sand, concrete	1,980	10,500	5.30
Stone sand, bituminous mix or seal	W	W	4.73
Screening, undesignated	2,770	13,100	4.73
Other fine aggregates	1,120	6,190	5.53
Coarse and fine aggregates:			
Graded road base or subbase	12,900	40,700	3.16
Unpaved road surfacing	243	1,190	4.90
Crusher run or fill or waste	5,670	15,100	2.66
Other coarse and fine aggregates	W	W	3.09
Other construction materials 3/	1,950	8,700	4.46
Agricultural:			
Agricultural limestone	406	3,200	7.88
Poultry grit and mineral food	199	2,190	11.00
Other agricultural uses	194	1,030	5.31
Chemical and metallurgical:			
Cement manufacture	(4/)	(4/)	1.40
Chemical stone	15	209	13.90
Glass manufacture	118	1,560	13.20
Special: Asphalt fillers or extenders	246	2,040	8.29
Other specified uses not listed	(4/)	(4/)	7.80

See footnotes at end of table.

TABLE 2--Continued
FLORIDA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS
IN 1995, BY USE 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Unspecified: 5/			
Actual	21,800	138,000	6.33
Estimated	5,610	26,500	4.72
Total	68,000	350,000	5.14

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes calcareous marl, dolomite, granite, limestone, limestone-dolomite, and shell.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes drain fields.

4/ Withheld to avoid disclosing company proprietary data; included in "Total."

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
FLORIDA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1994				1995			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	80 r/	64,000 r/	\$329,000 r/	\$5.14	74	64,700	\$333,000	\$5.15
Dolomite	4 r/	1,160	W	W	4	1,120	7,010	6.28
Shell	6	1160	4530	3.92	5	1,090	4,100	3.78
Calcareous marl	1 r/	(3/)	W	W	2	W	W	4.53
Granite	--	--	--	--	3	W	W	5.26
Total	XX	66,300 r/	343,000	5.18 r/	XX	68,000	350,000	5.14

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes "Limestone-dolomite," reported with no distinction between the two.

3/ Excludes calcareous marl quantity from State total to avoid disclosing company proprietary data.

TABLE 4
FLORIDA: CRUSHED STONE 1/ SOLD OR USED BY PRODUCERS IN 1995, BY USE AND DISTRICT 2/

(Thousand metric tons and thousand dollars)

Use	District 1		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 3/	--	--	70	525	37	186
Coarse aggregate, graded 4/	--	--	7,040	56,700	4,120	20,200
Fine aggregate (-3/8 inch) 5/	--	--	4,060	21,400	2,960	13,900
Coarse and fine aggregate 6/	68	474	9,450	32,000	9,590	25,400
Other construction materials 7/	(8/)	(8/)	(8/)	(8/)	--	--
Agricultural 9/	(8/)	(8/)	(8/)	(8/)	--	--
Chemical and metallurgical 10/	--	--	(8/)	(8/)	--	--
Special 11/	--	--	246	2,040	--	--
Other miscellaneous uses 12/	--	--	(8/)	(8/)	--	--
Unspecified: 13/						
Actual	833	3,230	2,990	16,500	18,000	118,000
Estimated	1,100	5,310	1,970	9,550	2,540	11,600
Total	2,200	10,700	28,600	150,000	37,200	189,000

1/ Production reported in District 2 was included with "District 3" to avoid disclosing company proprietary data.

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Includes filter stone and riprap and jetty stone.

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

7/ Includes drain fields.

8/ Withheld to avoid disclosing company proprietary data; included in "Total."

9/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

10/ Includes cement manufacture, chemical stone for alkali works, and glass manufacture.

11/ Includes asphalt fillers or extenders.

12/ Includes other specified uses not listed.

13/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995,
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	6,110	\$24,900	\$4.08
Plaster and gunite sands	359	1,460	4.05
Concrete products (blocks, bricks, pipe, decorative, etc.)	479	2,240	4.68
Asphaltic concrete aggregates and road base materials 2/	3,120	6,500	2.08
Other 3/	788	3,830	4.86
Unspecified: 4/			
Actual	3,320	13,500	4.06
Estimated	5,170	16,900	3.26
Total or average	19,300	69,300	3.58

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes fill, road and other stabilization (cement and lime).

3/ Includes filtration.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1995,
BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	W	W	W	W
Asphaltic concrete aggregates and road base materials 3/	W	W	W	W
Other miscellaneous uses 4/	1,540	3,910	4,790	20,600
Unspecified: 5/				
Actual	229	2,110	1,120	4,770
Estimated	2,060	7,070	2,110	6,710
Total	3,820	13,100	8,020	32,100
	District 3		District 4	
	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	1,350	5,710	--	--
Asphaltic concrete aggregates and road base materials 3/	1,610	3,760	867	1,520
Other miscellaneous uses 4/	696	3,390	--	--
Unspecified: 5/				
Actual	1,690	6,140	283	480
Estimated	889	2,700	119	408
Total	6,240	21,700	1,270	2,410

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes fill, road and other stabilization (cement and lime).

4/ Includes filtration.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

THE MINERAL INDUSTRY OF FLORIDA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Bureau of Mines, U.S. Department of the Interior, and the Florida Department of Mines and Mineral Resources for collecting information on all nonfuel minerals.

Florida ranked ninth among the 50 States in total nonfuel mineral production value² in 1995, according to the U.S. Geological Survey (USGS). This is a decline from eighth place in 1994. The estimated value for 1995 was \$1.4 billion, an increase of about 1% from that of 1994. This followed a 4.5% increase in 1994 from that of 1993 (based on final 1994 data). The State accounted for about 4% of the U.S. total nonfuel mineral production value.

Florida continued to be the Nation's leading phosphate rock-mining State in 1995, producing more than four times the quantity as the next-highest State. Phosphate rock is only produced in four States. The phosphate rock industry usually has the most impact on the State's raw nonfuel mineral economy. Other minerals that commonly have a significant effect on the State's overall nonfuel mineral production value are crushed stone, construction sand and gravel, and portland cement. In 1995, the increase in the State's mineral production value mainly resulted from a substantial increase in the value of phosphate rock. This increase was mitigated by decreases in portland cement, zircon concentrates, and titanium concentrates. The overall increase extended the rebound in Florida's mineral production value begun in 1994. Since reaching the State's second all-time high of \$1.61 billion in 1989, the State's

mineral value had been on a downward trend. This culminated in the 9% drop to \$1.31 billion from 1992 to 1993; declining phosphate rock value was the principal contributor. Most other mineral commodities in 1993 increased. In 1994, the increased values of crushed stone, phosphate rock, and portland and masonry cements were principally responsible for the turnaround in mineral value.

Compared with 1994, the values of fuller's earth clays, staurolite, and peat increased in 1995. In addition to the more significant decreases mentioned above, other mineral commodities had small to only slight decreases in 1995. These were: crushed stone, construction sand and gravel, masonry cement, magnesium compounds, industrial sand and gravel, and common and kaolin clays.

Florida, almost exclusively an industrial-mineral-producing State, remained first in phosphate rock and first of two States with ilmenite (a titanium ore) production, fourth in crushed stone, and seventh in portland cement. (All rankings are based on 1995 USGS-estimated data).² Additionally, Florida was the only State to produce zircon concentrates, staurolite, and rutile concentrates (a titanium ore). While climbing from second to first in the production of masonry cement, the State dropped from first to second in peat production; second to third in magnesium

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN FLORIDA^{1 2}

Mineral	1993		1994		1995 ^a	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:						
Masonry metric tons	351,000	\$27,300	400,000	\$34,600	393,000	\$34,000
Portland do.	4,190,000	211,000	3,370,000	228,000	2,970,000	200,000
Clays ³ thousand metric tons	407	52,700	430	55,000	363	55,100
Peat metric tons	219,000	3,780	206,000	3,230	W	W
Sand and gravel:						
Construction thousand metric tons	22,800	73,100	16,600	60,700	15,800	59,300
Industrial metric tons	504,000	5,910	540,000	6,120	591,000	6,050
Stone (crushed) thousand metric tons	64,900	313,000	67,000	343,000	66,500	343,000
Combined value of clays (common), gemstones, magnesium compounds, phosphate rock, rare-earth metal concentrates (1993-94), staurolite, stone [crushed dolomite and limestone (1993)], titanium concentrates (ilmenite and rutile), zircon concentrates, and value indicated by symbol W						
	XX	624,000	XX	639,000	XX	689,000
Total	XX	1,310,000	XX	1,370,000	XX	1,390,000

^aEstimated. ^bPreliminary. W Withheld to avoid disclosing company proprietary data; value included with "Combine value" data. XX Not applicable.

¹Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

²Data are rounded to three significant digits; may not add to totals shown.

³Excludes certain clays; kind and value included with "Combined value" data.

⁴Excludes certain stones; kind and value included with "Combined value" data.

compounds; and third to fourth in fuller's earth. Although not placing among the top 10 producing States, Florida mines produced significant quantities of construction and industrial sand and gravel.

The remainder of this narrative was derived from information provided by the Florida Geological Survey. In 1995 Florida State Legislature, passed a new law entitled the "Life-of-the-Mine Permit." This bill, which designates the Florida Bureau of Mine Reclamation (BOMR) as the regulatory authority, was intended to ease the overall permitting process for operators producing fuller's earth and heavy minerals. The new law allows the operator to combine several different permits and plans into one environmental permit. Included in the Life-of-the-Mine Permit are dredge and fill permits, the mine's reclamation plan, and management and storage of surface water permits. BOMR was made responsible for initiating and coordinating a concurrent review of two portions of the Life-of-the-Mine Permit: the industrial waste water and the national pollution discharge elimination system permits. Previously, these permits were handled by various agencies, including the former Florida Department of Environmental Regulation, the Florida Department of Natural Resources, and the State's Water Management District Offices. The U.S. Army Corps of Engineers will continue processing Federal dredge and fill permits.

Rising phosphate rock production led to increased employment and profitability for companies. Although most of the phosphate rock produced during the year was sold domestically, exports of phosphate fertilizers continued to play an important role in the industry's vitality. The largest consuming nations of Florida phosphate were China, India, and the countries of eastern Europe and the former Soviet Union. The companies that were engaged in phosphate mining in the State in 1995 included: Cargill Fertilizer Inc., CF Industries Inc., IMC-Agrico Co., Mobil Mining and Minerals Co., and White Springs Agricultural Chemicals, Inc. (formerly Occidental Chemical Corp.). Of these, IMC-Agrico brought the Clear Springs Mine back on line in 1994. CF Industries opened its South Pasture Mine during the 4th quarter. Mobil Mining recently sold its South Fort Meade Mine to Cargill Fertilizer.

The new voice of the Florida aggregate industry is the

Florida Limerock and Aggregate Institute (FLAI). The institute is an autonomous division of the Florida Concrete Products Association, with which it recently merged. The primary focus of the FLAI is the pursuit of promotional, technical, and regulatory matters of concern to the aggregate industry. The Florida aggregate industry is working closely with the Florida Department of Transportation to improve the effectiveness of the quality assurance program used to control aggregate quality. In other activities within the Florida aggregate industry, Martin Marietta Aggregates purchased the Florida production and redistribution terminal operations formerly owned by Dravo Basic Materials Co.

RGC (USA) Mineral Sands, Inc., ceased extraction of monazite from the heavy mineral sands concentrate at its Clay County facility. However, heavy mineral mining continued from dredging operations on leased lands in Clay and Putnam Counties, while extraction of ilmenite, rutile, and zircon concentrate was done in Clay County. E. I. du Pont de Nemours & Co. Inc. continued mining the entire Trail Ridge area in Clay and Baker Counties, especially for rutile and ilmenite. These titanium-bearing heavy minerals are a primary ingredient in the manufacture of titanium dioxide pigments.

Although production of specialty grades of clay were increasing, the overall clay business continued to decline during 1995. The majority of this decline was in the absorbent products market sector and appeared to be a result of environmental pressures being placed on petroleum cleanup operations regarding the disposal of contaminated clay.

¹An additional contact is Steven Spencer, coastal/economic geologist, same address and fax number as Dr. Schmidt, telephone: (904) 488-9380, internet: spencer_s@dep.state.fl.us

²The terminologies "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1995 USGS mineral production data published in this chapter are estimated as of Dec. 1995. Estimates for some commodities, e.g., construction sand and gravel, crushed stone, and portland cement, are periodically updated. To obtain the most recent information please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from your fax machine and request Document No. 1000 for a telephone listing of all mineral commodity specialists or call USGS information at (703) 648-4000 for the specialist's name and number.

TABLE 2
FLORIDA: CRUSHED STONE¹ SOLD OR USED BY PRODUCERS IN 1994, BY USE²

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	50	\$296	\$5.92
Filter stone	220	1,610	7.30
Other coarse aggregate	W	W	16.50
Coarse aggregate, graded:			
Concrete aggregate, coarse	12,300	85,100	6.92
Bituminous aggregate, coarse	4,410	26,800	6.09
Bituminous surface-treatment aggregate	760	4,220	5.56
Railroad ballast	137	226	1.65
Other graded coarse aggregate	W	W	5.63
Fine aggregate (-3/8 inch):			
Stone sand, concrete	3,930	24,200	6.15
Stone sand, bituminous mix or seal	1,990	10,700	5.40
Screening, undesignated	3,770	20,900	5.55
Other fine aggregates	W	W	4.65
Coarse and fine aggregates:			
Graded road base or subbase	15,800	61,000	3.85
Unpaved road surfacing	355	1,470	4.15
Crusher run or fill or waste	3,490	8,420	2.41
Other coarse and fine aggregates	2,640	12,900	4.88
Other construction materials	1,340	7,280	5.42
Agricultural:			
Agricultural limestone	563	6,330	11.20
Other agricultural uses ³	392	2,220	5.67
Special:			
Asphalt fillers or extenders	86	648	7.53
Other fillers or extenders	1	4	4.00
Other specified uses not listed ⁴	1,920	2,890	1.51
Unspecified: ⁵			
Actual	8,160	39,500	4.84
Estimated	4,600	26,700	5.80
Total	67,000	343,000	5.13

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

¹Includes calcareous marl, dolomite, limestone, limestone-dolomite, and shell.

²Data are rounded to three significant digits; may not add to totals shown.

³Includes poultry grit and mineral food.

⁴Includes cement manufacture.

⁵Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 3
FLORIDA: CRUSHED STONE SOLD OR USED, BY KIND¹

Kind	1993				1994			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone ²	85	62,500	³ \$301,000	³ \$4.81	82	64,200	\$330,000	\$5.14
Shell	8	1,130	4,240	3.76	6	1,160	4,530	3.92
Dolomite	3	W	5,020	W	3	W	W	5.84
Calcareous marl	1	W	3,190	W	1	W	W	5.09
Total	XX	64,900	313,000	4.83	XX	67,000	343,000	5.13

¹Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

²Data are rounded to three significant digits; may not add to totals shown.

³Includes "Limestone-dolomite," reported with no distinction between the two.

⁴Excludes limestone-dolomite value from State total to avoid disclosing company proprietary data.

TABLE 4
FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1994, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) ²	—	—	(³)	(³)	17	76	(³)	(³)
Coarse aggregate, graded ⁴	(³)	(³)	(³)	(³)	6,810	50,900	10,600	63,000
Fine aggregate (-3/8 inch) ⁵	(³)	(³)	(³)	(³)	3,520	19,400	6,770	39,200
Coarse and fine aggregate ⁶	(³)	(³)	(³)	(³)	3,860	12,900	11,700	47,400
Other construction materials	—	—	—	—	—	—	(³)	(³)
Agricultural ⁷	(³)	(³)	(³)	(³)	781	7,500	—	—
Chemical and metallurgical ⁸	—	—	—	—	W	W	—	—
Special ⁹	—	—	—	—	W	W	—	—
Other miscellaneous uses	—	—	—	—	2,000	3,540	—	—
Unspecified: ¹⁰								
Actual	513	1,440	830	5,230	85	694	6,740	32,200
Estimated	658	4,030	1,520	11,400	620	3,150	1,810	8,130
Total	2,420	11,600	8,920	42,300	17,700	98,100	37,900	191,000

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."

¹Data are rounded to three significant digits; may not add to totals shown.

²Includes filter stone, riprap and jetty stone, and other coarse aggregate.

³Withheld to avoid disclosing company proprietary data; included in "Total."

⁴Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

⁵Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

⁶Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

⁷Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

⁸Includes cement manufacture.

⁹Includes other specified uses not listed.

¹⁰Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 5
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1994, BY MAJOR USE CATEGORY¹

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	6,790	\$28,800	\$4.25
Plaster and gunite sands	367	1,380	3.75
Concrete products (blocks, bricks, pipe, decorative, etc.)	515	2,320	4.50
Asphaltic concrete aggregates and other bituminous mixtures	547	3,560	6.50
Road base and coverings ²	546	1,550	2.85
Fill	2,470	4,200	1.70
Other ³	948	4,870	5.14
Unspecified: ⁴			
Actual	883	3,170	3.59
Estimated	3,560	10,800	3.04
Total or average	16,600	60,700	3.65

¹Data are rounded to three significant digits; may not add to totals shown.

²Includes road and other stabilization (lime).

³Includes filtration.

⁴Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 6
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1994, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products ²	1,250	5,660	4,950	20,900	1,480	6,000	—	—
Asphaltic concrete aggregates and road base materials ³	505	2,850	498	1,240	1,530	3,080	1,030	2,140
Other miscellaneous uses ⁴	16	42	148	994	664	3,300	121	531
Unspecified: ⁵								
Actual	54	476	385	1,700	249	671	195	323
Estimated	1,130	3,630	1,450	4,190	848	2,620	136	400
Total	2,950	12,700	7,430	29,000	4,770	15,700	1,480	3,390

¹Data are rounded to three significant digits; may not add to totals shown.

²Includes plaster and gunite sands.

³Includes fill and road and other stabilization (lime).

⁴Includes filtration.

⁵Includes production reported without a breakdown by end use and estimates for nonrespondents.

THE MINERAL INDUSTRY OF FLORIDA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Bureau of Mines, U.S. Department of the Interior, and the Florida Geological Survey for collecting information on all nonfuel minerals.

Florida ranked sixth among the 50 States in total nonfuel mineral value¹ in 1994, climbing from 8th in 1993, according to the U.S. Bureau of Mines. The estimated value for 1994 was \$1.5 billion, an 12% increase over that of 1993. This followed a 9% decrease in 1993 from that of 1992. The State accounted for 5% of the U.S. total value and continued to lead significantly the other U.S. States in phosphate rock production and value. The total value decreased in 1993, mainly due to a drop in phosphate rock values. But the rebound in 1994 was attributed to a combination of increased values for phosphate rock, crushed stone, construction sand and gravel, and masonry cement. The latter three commodities have increased consistently during the last 3 years. Florida, almost exclusively an industrial mineral producing State, remained first in the production of phosphate rock, masonry cement, peat, titanium concentrates, and metal; second in rare-earth concentrates and fuller's earth clay; and third in crushed stone and magnesium compounds. The State rose from sixth to fifth in portland cement production. Compared with 1993, the value of phosphate rock, crushed stone, construction sand and gravel, masonry cement, industrial

sand and gravel, and peat increased in 1994. Decreases occurred in the value of portland cement, common and kaolin clays, and the rare-earth metal concentrates.

In 1994, the phosphate industry rebounded somewhat from significant production and value drops in 1993—one of the most difficult of recent years. Production of phosphate rock, primarily used to manufacture fertilizer, increased moderately in 1994 and some previously closed operations were able to reopen. Consumption increased substantially, especially for diammonium phosphate, in large part to supply increased export demands. The industry continued research to develop technologies that would enable mining companies to further reduce the need for deep-aquifer water. Presently, the industry recirculates about 80% of the water it uses in certain manufacturing processes. Limestone production was moderately up in 1994 compared with that of 1993; this was due, in part, to increased highway and residential construction. Compliance with the 1990 amendments to the Clean Air Act (CAA) was a controversial issue for mining facility operators who were required to obtain permits for work already in progress in addition to all new work, according

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN FLORIDA¹

Mineral	1992		1993		1994 ²	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:						
Masonry thousand metric tons	310	\$22,424	351	\$27,264	462	\$35,900
Portland do.	2,898	161,969	4,195	210,762	4,120	207,000
Clays ³ do.	367	37,201	407	52,699	408	52,800
Gemstones	NA	1	NA	W	NA	W
Peat thousand metric tons	191	3,158	219	3,781	250	4,060
Sand and gravel:						
Construction do.	21,107	66,141	*22,800	*73,100	25,000	83,700
Industrial do.	433	5,167	504	5,911	W	W
Stone (crushed) ³ do.	*53,796	*266,900	64,926	313,270	*72,000	*360,000
Combined value of clays [common, kaolin (1994)], magnesium compounds, phosphate rock, rare-earth metal concentrates, staurolite, stone [crushed dolomite and limestone (1993-94), crushed marl (1992)], titanium concentrates (ilmenite and rutile), zircon concentrates, and values indicated by symbol W						
	XX	876,799	XX	623,845	XX	724,000
Total	XX	1,439,760	XX	1,310,632	XX	*1,470,000

¹Estimated. ²Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" data. XX Not applicable.

³Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

⁴Excludes certain clays; kind and value included with "Combined value" data.

⁵Excludes certain stones; kind and value included with "Combined value" data.

⁶Data do not add to total shown because of independent rounding

to the Florida Limerock Institute.

mine shipments, mineral commodity sales, or marketable production as is applicable to the individual mineral commodities.

¹The term value means the total monetary value as represented by either

TABLE 2
FLORIDA: CRUSHED STONE¹ SOLD OR USED BY PRODUCERS IN 1993, BY USE

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Riprap and jetty stone	125	\$572	\$4.58
Filter stone	349	2,228	6.38
Other coarse aggregate	W	W	2.21
Coarse aggregate, graded:			
Concrete aggregate, coarse	10,937	63,806	5.83
Bituminous aggregate, coarse	3,280	21,821	6.65
Bituminous surface-treatment aggregate	936	6,891	7.36
Railroad ballast	W	W	5.07
Other graded coarse aggregate	W	W	8.00
Fine aggregate (-3/8 inch):			
Stone sand, concrete	5,097	29,924	5.87
Stone sand, bituminous mix or seal	2,116	11,564	5.47
Screening, undesignated	5,167	20,816	4.03
Other fine aggregate	W	W	6.84
Coarse and fine aggregates:			
Graded road base or subbase	19,884	72,266	3.63
Unpaved road surfacing	418	1,881	4.50
Crusher run or fill or waste	2,043	4,493	2.20
Other coarse and fine aggregates	963	3,113	3.23
Other construction materials ²	2,727	18,490	6.78
Agricultural:			
Agricultural limestone	366	3,111	8.50
Poultry grit and mineral food	593	4,787	8.07
Other agricultural uses	238	(³)	(³)
Chemical and metallurgical:			
Cement manufacture	3,515	18,297	5.21
Glass manufacture	46	701	15.24
Special:			
Asphalt fillers or extenders	150	2,294	15.29
Other fillers or extenders	169	1,562	9.24
Other specified uses not listed	871	2,759	3.17
Unspecified: ³			
Actual	891	4,193	4.71
Estimated	4,045	17,698	4.38
Total	64,926	⁴ 313,270	4.83
Total ^{5 6}	71,569	313,270	4.38

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

¹Includes dolomite, limestone, limestone-dolomite, calcareous marl, and shell.

²Excludes limestone-dolomite value from State total to avoid disclosing company proprietary data.

³Includes production reported without a breakdown by use and estimates for nonrespondents.

⁴Data do not add to total shown because of independent rounding.

⁵One short ton is equal to 907 kilograms or 2,000 pounds. To convert metric tons to short tons, divide metric tons by 0.907185.

⁶Total shown in thousand short tons and thousand dollars.

TABLE 3
FLORIDA: CRUSHED STONE SOLD OR USED, BY KIND

Kind	1991				1993			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone ¹	'96	'52,774	'\$252,422	'\$4.78	85	62,492	² \$300,827	² \$4.81
Dolomite	3	822	5,059	6.15	3	W	5,015	W
Calcareous marl	(³)	(³)	(³)	(³)	1	W	3	W
Shell	5	1,043	5,103	4.89	8	1,126	4,239	3.76
Total ⁴	XX	'55,005	'264,847	4.81	XX	64,926	313,270	4.83
Total ^{5 6}	XX	'60,633	'264,847	'4.37	XX	71,569	313,270	4.38

¹Revised. W Withheld to avoid disclosing company proprietary data; included with "Total." XX Not applicable.

²Includes "Limestone-dolomite," reported with no distinction between the two.

³Excludes limestone-dolomite value from State total to avoid disclosing company proprietary data.

⁴Excludes calcareous marl from State totals to avoid disclosing company proprietary data.

⁵Data may not add to totals shown because of independent rounding.

⁶One short ton is equal to 907 kilograms or 2,000 pounds. To convert metric tons to short tons, divide metric tons by 0.907185.

⁷Total shown in thousand short tons and thousand dollars.

TABLE 4
FLORIDA: CRUSHED STONE¹ SOLD OR USED BY PRODUCERS IN 1993, BY USE AND DISTRICT

Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) ²	—	—	(³)	(³)	W	W	669	3,037
Coarse aggregate, graded ⁴	(³)	(³)	(³)	(³)	5,836	38,367	10,056	59,597
Fine aggregate (-3/8 inch) ⁵	(³)	(³)	(³)	(³)	3,493	13,952	8,660	47,136
Coarse and fine aggregate ⁶	(³)	(³)	6,201	23,195	W	W	12,721	43,647
Other construction materials	—	—	(³)	(³)	4,135	14,181	(⁷)	(⁷)
Agricultural ⁷	(³)	(³)	(³)	(³)	786	3,026	—	—
Chemical and metallurgical ⁸	—	—	46	701	(⁹)	(⁹)	(⁹)	(⁹)
Special ¹⁰	—	—	(³)	(³)	(⁹)	(⁹)	—	—
Other miscellaneous uses	—	—	—	—	1,906	8,817	3,531	18,800
Unspecified: ¹¹								
Actual	321	2,409	447	2,683	122	653	—	—
Estimated	713	4,050	819	3,624	563	2,863	1,950	8,804
Total ¹²	1,873	8,024	8,623	42,364	16,842	81,862	37,588	181,020
Total ^{13 14}	2,065	8,024	9,505	42,364	18,565	81,862	41,434	181,020

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

¹Excludes limestone - dolomite value from State total to avoid disclosing company proprietary data.

²Includes filter stone, riprap and jetty stone, and other coarse aggregate.

³Withheld to avoid disclosing company proprietary data; included with "Total."

⁴Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

⁵Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

⁶Includes graded road base or subbase, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

⁷Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

⁸Includes cement manufacture and glass manufacture.

⁹Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses."

¹⁰Includes asphalt fillers or extenders, other fillers or extenders, and other specified uses not listed.

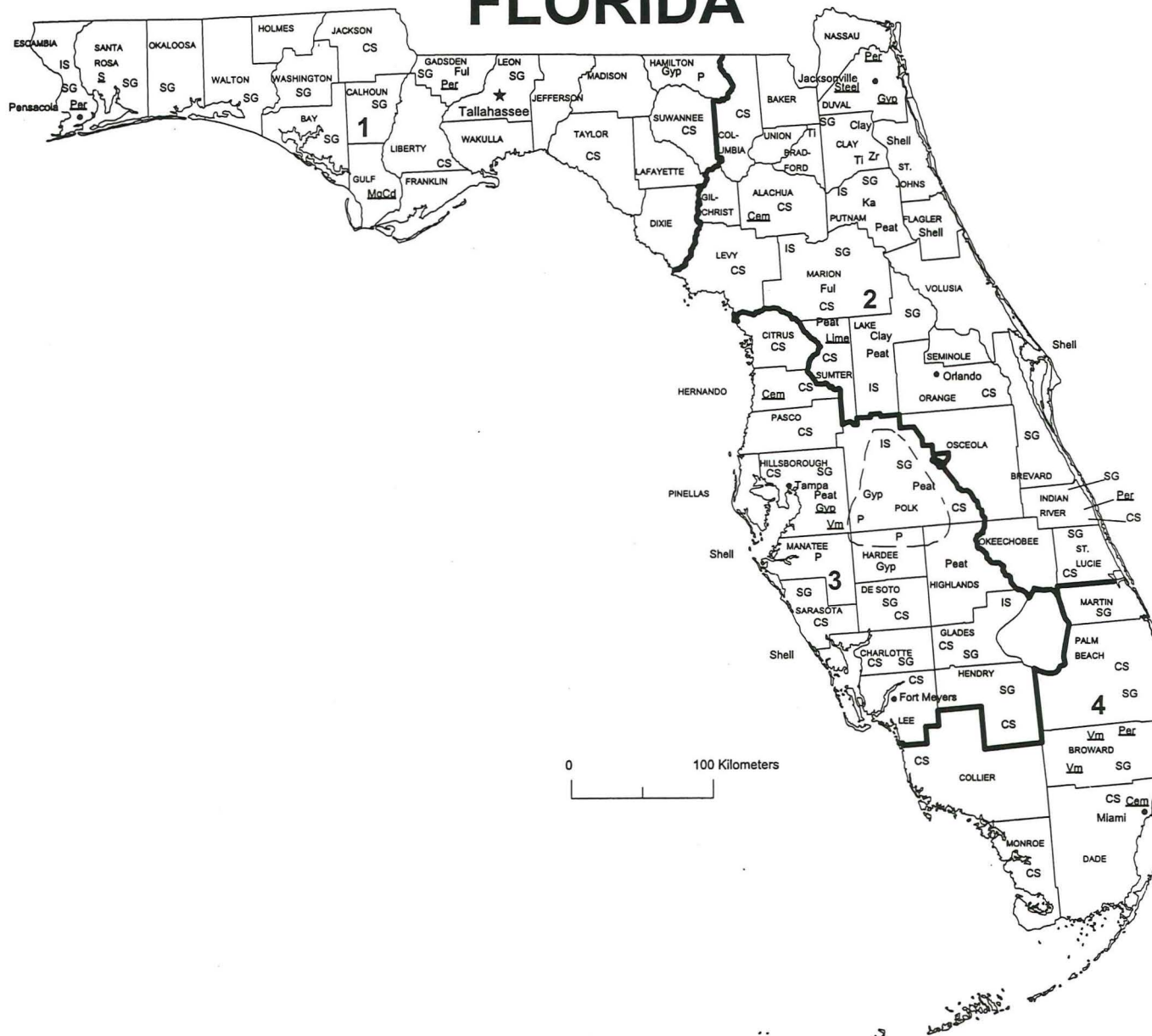
¹¹Includes production reported without a breakdown by use and estimates for nonrespondents.

¹²Data may not add to totals shown because of independent rounding.

¹³One short ton is equal to 907 kilograms or 2,000 pounds. To convert metric tons to short tons, divide metric tons by 0.907185.

¹⁴Total shown in thousand short tons and thousand dollars.

FLORIDA



LEGEND

— County boundary

★ Capital

• City

1 — Crushed stone/sand and gravel districts

MINERAL SYMBOLS (Major producing areas)

Cem Cement plant

Clay Clay

CS Crushed stone

Ful Fuller's earth

Gyp Byproduct gypsum

Gyp Gypsum plant

Ka Kaolin

Lime Lime plant

MgCd Magnesium compounds plant

P Phosphate rock

Peat Peat

Per Perlite plant

SG Construction sand and gravel

IS Industrial sand

Shell Shell

Steel Steel plant

S Sulfur plant

Ti Titanium minerals

Vm Vermiculite plant

Zr Zircon

○ Concentration of mineral operations

Source: Florida Geological Survey/U.S. Geological Survey (1999)

CRUSHED STONE

By Valentin V. Tepordei

Crushed stone is one of the most accessible natural resources and a major basic raw material used by a wide range of industries from construction to agriculture, chemicals, and industrial processes. Despite the relative lowvalue of its basic products, the crushed stone industry is a major contributor to and an indicator of the economic well-being of the Nation.

A total of 1.23 billion metric tons of crushed stone was produced for consumption in the United States in 1994, a 9.8% increase compared with the total production of 1993. This tonnage represents the highest production level ever recorded in the United States, indicating a continued increase in the demand for construction aggregates in 1994. (See table 1.)

About three-quarters of the crushed stone production continued to be limestone and dolomite, followed by granite, traprock, sandstone and quartzite, miscellaneous stone, calcareous marl, marble, volcanic cinder and scoria, slate, and shell, in order of volume. (See table 2.)

Foreign trade of crushed stone continued to remain relatively small in 1994. Exports increased 7.3% to 5.2 million tons, while value decreased 3% to \$38.1 million compared with that of 1993. Imports of crushed stone, including calcium carbonate, increased 5.8% to 8.9 million tons, while the value increased 4.7% to \$77.8 million. Domestic apparent consumption of crushed stone was 1.23 billion tons. (See tables 1, 22 and 23.)

Legislation and Government Programs

Department of Transportation and Related Agencies Appropriation Act of 1994, (Public Law 103-122), was signed by the President on October 27, 1994. The Act appropriates \$20.6 billion for new highway spending, a \$2 billion increase from the fiscal year 1993 total. The Act also includes a \$2.2 billion appropriation in grants for airport construction, and provision for a one-year delay in the imposition of the "crumb rubber" use in highway construction as required by the ISTEA Act of 1991.

Production

Domestic production data for crushed stone

are developed by the U.S. Bureau of Mines (USBM) from voluntary surveys of U.S. producers. In response to the customers' requests to provide better statistical information on construction aggregates, the USBM reintroduced the annual surveys on crushed stone beginning with 1994 calendar year, in addition to the quarterly survey of crushed stone and sand and gravel.

Of the 5,127 crushed stone operations surveyed in 1994, 3,238 operations with 3,897 quarries were active. Of these, 2,523 operations with 3,118 quarries representing 77.9% of the total number of operations reported to the USBM survey and their total production, represented 89.2% of the total U.S. crushed stone output. The nonrespondent's production was estimated using employment data and/or adjusted prior years' production reports. Of the 2,523 reporting operations, 510 operations with 803 quarries did not report a breakdown by end use. Their production represented 21.4% of the U.S. total and is included in table 13 under "Unspecified uses, actual." The estimated production of 715 nonresponding operations represented 10.8% of the U.S. total and is included in table 13 under "Unspecified uses, estimated." A total of 751 quarries were either idle or presumed to have been idle in 1994 because no information was available to estimate their production. A total of 943 operations were closed down since 1993, the last year when a full survey of crushed stone producers was conducted. Most of the idle or closed operations were small temporary quarries operated by the State or local governments.

A total of 1.23 billion tons of crushed stone was produced for consumption in the United States in 1994, a 9.8% increase compared with that of 1993. This tonnage represents the highest production level ever recorded in the United States. (See table 1.) Of this total, 881 million tons or 71.7% was limestone and dolomite, 178 million tons or 14.5% was granite, and 91 million tons or 7.4% was traprock. The remaining 6.4% was shared, in descending order of quantity, by sandstone and quartzite, miscellaneous stone, calcareous marl, marble, slate, volcanic cinder and scoria, and shell. (See table 2.)

A comparison of the four major geographic regions indicates that in 1994 the South continued to lead the Nation in the production

of crushed stone with 562.8 million tons or 45.8% of the total, followed by the Midwest with 380.1 million tons or 30.9%, and the Northeast with 162.0 million tons or 13.2%. Approximately 77% of the total U.S. crushed stone output was produced in two major geographic regions, the South and the Midwest. (See table 3.)

Of the nine geographic regions, the South Atlantic led the Nation in the production of crushed stone with 292.7 millions tons or 23.8% of the U.S. total. Next was the East North Central region with 228.7 or 18.7% of the total, followed by the West North Central with 150.4 million tons or 12.2%.

A comparison between the 1993 and 1994 production data by regions indicates that the output of crushed stone increased in all regions except the Mountain. The largest increases were recorded in the West North Central region, +20.9%; the New England, +19.7%; and the East South Central, +13.1%.

Crushed stone was produced in every State except Delaware and North Dakota. The 10 leading States in the production of crushed stone, in order of volume, were Pennsylvania, Texas, Missouri, Florida, Illinois, Virginia, Ohio, Kentucky, Georgia, and North Carolina. Their combined production represented 51.2% of the national total. Crushed stone was produced by 1,584 companies at 3,238 operations with 3,897 quarries. Leading U.S. producers in order of volume were, Vulcan Materials Co., Cornerstone Construction & Materials, Inc./Hanson Industries, Martin-Marietta Aggregates, CSR America Inc., and Rogers Group, Inc.

Effective June 1, 1994, English China Clay's Construction Materials Division of Cheltenham, Gloucestershire, England, was "demerged" from the English China Clay PLC Group and a new company, CAMAS PLC, was created. These changes affected its U.S. subsidiary, the ECC Construction Materials America, Inc. of Lakewood, CO, that became CAMAS America, Inc.

In July, Tarmac America, Inc. of Herndon, VA, announced the reorganization of its operations into three product line groups: aggregates and cement, ready-mixed concrete, and concrete products. The company headquarters also were moved to Norfolk, VA.

In the second half of the year, Martin

Marietta Aggregates of Raleigh, NC, purchased Dravo Corp.'s construction aggregates business. Included in the acquisition were 22 production facilities located in nine States and the Bahamas that became the Martin Marietta Central Region Division.

Limestone.—The 1994 output of crushed limestone, including some dolomite, increased 10.8% to 788 million tons valued at \$3.9 billion, compared with the 1993 totals. (See table 2.) In addition to the quarries reporting only limestone, 64 operations with 76 quarries reported producing both limestone and dolomite, without making a distinction between the two kinds of stone. Their production, 25.7 million tons, was included with the limestone, and therefore, the limestone totals shown in this chapter include an undetermined amount of dolomite, in addition to the dolomite reported separately.

Limestone was produced by 917 companies at 1,896 operations with 1,996 quarries in 47 States. In addition, 46 companies with 64 operations and 67 quarries reported producing limestone and dolomite from the same quarries. Leading States, in order of tonnage, were Texas, Florida, Missouri, Kentucky, and Pennsylvania; these five States accounted for 37% of the total U.S. output. (See table 8.)

Leading U.S. producers were, in order of volume, Vulcan Materials Co., Cornerstone Construction & Materials, Inc./Hanson Industries, CSR America, Inc., Martin Marietta Aggregates, and Rogers Group, Inc.

Dolomite.—Production of dolomite increased 14.0% to 92.7 million tons valued at \$479 million, compared with that of 1993. (See table 2.) Crushed dolomite was reportedly produced by 93 companies at 164 operations with 174 quarries in 26 States. An additional undetermined amount of dolomite is included in the total crushed limestone. Leading States in the production of dolomite, in order of tonnage, were Pennsylvania, Ohio, New York, Michigan, and Indiana; these five States accounted for 37.0% of the total U.S. output. (See table 8.)

Leading U.S. producers were Vulcan Materials Co.; Cornerstone Construction & Materials, Inc./Hanson Industries; Glasgow, Inc.; S. E. Johnson Companies/Stoneco, Inc.; and Asarco-American Limestone Co.

Marble.—Production of crushed marble increased 74.5% to 6.1 million tons valued at \$65 million. (See table 2.) Crushed marble was produced by 13 companies with 26 operations and 45 quarries in 10 States.

Leading producers of crushed marble, in order of tonnage, were Georgia Marble Co., Columbia River Carbonates, and CAMAS America, Inc.

Calcareous Marl.—Output of marl increased 17.2% to 6.2 million tons valued at 32.2 million. (See table 2.) Marl was produced by 14 companies with 14 operations at 16 quarries in 8 States. South Carolina accounted for 52% of total U.S. output. (See table 9.)

Leading producers, in order of tonnage, were Holderbank Holnam Inc., Capitol Aggregates Inc., and Medusa Corp./Medusa Cement Co.

Shell.—Shell is mainly derived from fossil reefs or oyster shell. The output of crushed shell decreased 10.1% to 1.8 million tons valued at \$10.3 million. (See table 2.) The decrease was mostly owing to the restrictions imposed on the industry in Louisiana as a result of concerns that shell dredging produces irreversible damage to the environment. Crushed shell was produced by 11 companies from 11 operations in 5 States.

Leading producers, in order of tonnage, were Dravo Basic Materials Co., Quality Aggregates, Inc., and Leisey Shell Corp.

Granite.—The 1994 output of crushed granite increased 6.0% to 178 million tons valued at \$1.1 billion. (See table 2.) Crushed granite was produced by 153 companies at 324 operations with 397 quarries in 33 States. Leading States, in order of tonnage, were Georgia, North Carolina, Virginia, South Carolina, and New Jersey; these five States accounted for 74.8% of the U.S. output. (See table 10.)

Leading U.S. producers, in order of tonnage, were Vulcan Materials Co., Martin Marietta Aggregates, Cornerstone Construction & Materials, Inc./Hanson Industries, Florida Rock Industries Inc., and Blue Circle America, Inc./Blue Circle Aggregates.

Traprock.—Production of crushed traprock increased 3.9% to 91.0 million tons valued at \$576 million. (See table 2.) Traprock was produced by 265 companies at 379 operations with 591 quarries in 27 States. Leading States, in order of tonnage, were Oregon, Virginia, Washington, New Jersey, and Hawaii; these five States accounted for 60.9% of U.S. output. (See table 10.)

Leading U.S. producers, in order of tonnage, were Vulcan Materials Co., Luck Stone Corp., Stavola, Inc./Traprock Industries, Meridian Aggregates Co., and Cornerstone Construction & Materials, Inc./Hanson Industries.

Sandstone and Quartzite.—The combined output of crushed sandstone and quartzite increased 5.5% to 34.3 million tons valued at \$212 million. (See table 2.) Crushed sandstone was produced by 110 companies at 138 operations with 193 quarries in 27 States, while crushed quartzite was produced by 33 companies at 34 operations with 37 quarries in

17 States. Leading States in the production of sandstone and quartzite in order of tonnage were Pennsylvania, Arkansas, and South Dakota; their combined production represented 43.6% of the U.S. output. (See table 10.)

Leading producers of sandstone and quartzite, in order of tonnage, were Ashland Oil, Inc.; APAC, Inc./Arkola Sand and Gravel Co., Western Mobile, Inc., and Oldcastle Inc./Callanan Industries, Inc.

Slate.—The 1994 output of crushed slate increased 30.6% to 2.7 million tons valued at \$18.9 million. (See table 2.) Crushed slate was produced by 13 companies at 15 quarries in 6 States. Most of the crushed slate was produced in North Carolina.

Leading producers, in order of tonnage, were Martin Marietta Aggregates, Carolina Stalite Co., and Mariposa Aggregates Co.

Volcanic Cinder and Scoria.—Production of volcanic cinder and scoria decreased in 1994 13.5% to 2 million tons valued at \$12.6 million. (See table 2.) Volcanic cinder and scoria were produced by 27 companies from 45 operations with 133 quarries in 14 States. Leading States, in order of volume were, California, New Mexico, and Hawaii; their combined production accounted for 44.5% of the total U.S. output. (See table 11.)

Leading producers, in order of tonnage, were Martin Marietta Aggregates, Stoney Point Rock Quarry Inc., and Byley H. G. & Sons Construction Co., Inc.

Miscellaneous Stone.—Output of other kinds of crushed stone increased 11.8% to 25.6 million tons valued at \$150 million. (See table 2.) Miscellaneous stone was produced by 105 companies from 129 operations with 223 quarries in 28 States. Leading States, in order of volume, were Pennsylvania, California, and North Carolina; their combined production accounted for 38.2% of the total U.S. output. (See table 11.)

Consumption

Crushed stone production reported to the USBM is actually material that was either sold or used by producers. Stockpiled production is not included in the reported quantities. Therefore, the "sold or used" tonnage represents the amount of production released for domestic consumption or export in a given year. Because some of the crushed stone producers did not report a breakdown by end use, their total production is included in "Other unspecified uses, actual." The estimated production of nonrespondents is included in "Other unspecified uses, estimated."

In 1994, U.S. consumption of crushed stone

was 1.2 billion tons valued at \$6.6 billion, a 9.8% increase compared with that of 1993. Of the 1.2 billion tons of crushed stone consumed in 1994, 396 million tons or 32.2% of the total was unspecified uses - actual and estimated. Of the remaining 832 million tons, about 83.2% was used as construction aggregates, mostly for highway and road construction and maintenance; 13.6% for chemical and metallurgical uses, including cement and lime manufacture; 2% for agricultural purposes; and 1% for special uses and products. (See table 13.) To provide a more accurate estimation of the consumption patterns for crushed stone, the "Unspecified uses" are not included in the above percentages. It is recommended that in any use pattern or marketing analysis the quantities included in "Unspecified uses" be distributed among the reported uses by applying the above percentages to the "Unspecified uses total."

Limestone.—Of the 788 million tons of crushed limestone consumed, 245 million tons or 31.1% was "Unspecified uses - actual and estimated." Of the remaining 543 million tons of crushed limestone reported by uses by the producers, 77.1% was used as construction aggregates, 19% for chemical and metallurgical uses including cement and lime manufacturing, 2.6% for agricultural purposes, and 1.1% for special uses and products. (See table 14.)

Dolomite.—Of the 93 million tons of crushed dolomite consumed, 6 million tons or 6.4% was "Unspecified uses - actual and estimated." Of the remaining 87 million tons of crushed dolomite reported by uses by the producers, 90.1% was used as construction aggregates, 5.6% for chemical and metallurgical uses, and 2.6% for agricultural purposes. An additional undefined amount of dolomite consumed in a variety of uses, mostly construction aggregates, is reported with the limestone. (See table 14.)

Marble.—Of the 6.1 million tons of crushed marble consumed, 3.3 million tons or 54.9% was reported as "Other unspecified uses." Of the remaining 2.8 million tons of crushed marble reported by uses by the producers, 1.6 million tons or 56.5% was used as miscellaneous uses, including fillers and extenders, and 1.1 million tons or 41.8% as construction aggregates. (See table 16.)

Calcareous Marl.—Of the 6.2 million tons of crushed calcareous marl consumed, 2.6 million tons or 42% was reported as "Other unspecified uses." Of the remaining 3.6 million tons of crushed marl reported by uses by the producers, 79.2% was used for cement manufacturing, and the remaining 20.8% as construction aggregates and for agricultural

purposes.

Shell.—Of the 1.8 million tons of crushed shell consumed, 115,000 tons or 6.4% was reported as "Other unspecified uses." Of the remaining 1.7 million tons of crushed shell reported by uses by the producers, 98.8% was used as construction aggregates.

Granite.—Of the 178 million tons of crushed granite consumed, 71 million tons or 39.9% was reported as "Other unspecified uses." Most of the remaining 107 million tons of crushed granite reported by uses by the producers was used as construction aggregates. (See table 17.)

Traprock.—Of the 91 million tons of crushed traprock consumed, 33 million tons or 36.4% was reported as "Other unspecified uses." Most of the remaining 58 million tons of crushed traprock reported by uses by the producers was used as construction aggregates. (See table 17.)

Sandstone and Quartzite.—Of the 27.4 million tons of crushed sandstone consumed, 13.3 million tons or 48.4% was reported as "Other unspecified uses." Most of the remaining 14.2 million tons of crushed sandstone reported by uses by the producers, was used as construction aggregates. (See table 18.)

Of the 6.8 million tons of crushed quartzite consumed, 3.1 million tons or 45.6% was reported as "Other unspecified uses." Most of the remaining 3.7 million tons of crushed quartzite reported by uses by the producers was used as construction aggregates. (See table 18.)

Volcanic Cinder and Scoria.—Of the 2.1 million tons of volcanic cinder and scoria consumed, 794,000 tons or 38.6% was reported as "Other unspecified uses." Most of the remaining 1.3 million tons of crushed volcanic cinder and scoria reported by uses by the producers was used as construction aggregates. (See table 19.)

Miscellaneous Stone.—Of the 36.3 million tons of miscellaneous crushed stone consumed, 20.7 million tons or 56.9% was reported as "Other unspecified uses." Of the remaining 15.6 million tons reported by uses by the producers, 81.8% was used as construction aggregates and 18.2% was used for cement manufacturing. (See table 19.)

Prices

Prices in this chapter are f.o.b. plant, usually at the first point of sale or captive use. This value does not include transportation from the plant or yard to the consumer. It does, however, include all costs of mining, processing, in-plant transportation, overhead costs and profit.

The 1994 average unit price per ton of crushed stone increased 1.6% to \$5.38, compared with that of 1993. By kind of stone, the average unit prices showed modest increases of 4.3% for calcareous marl and miscellaneous stone, 4.2% for granite, 3.7% for sandstone and quartzite, 3.6% for traprock, 3.1% for slate, 2% for limestone, and 0.5% for volcanic cinder and scoria. At the same time, the average unit prices decreased for marble 49.6%, for shell 8.2%, and for dolomite 4%. (See table 2.)

Transportation

No means of transportation was reported by the producers for 424 million tons or 34.5% of the total 1.23 billion tons of crushed stone produced for consumption in 1994. Of the remaining 806 million tons of crushed stone, 582 million tons or 72.2% was reported as transported by truck from the processing plant or quarry to the first point of sale or use, 6.8% was transported by rail, and 7.1% by waterway. About 11.3% of the total production was reported as not transported and therefore used on-site. Information regarding means of transportation used by the producers to ship crushed stone in each geographic region is also provided. (See table 20.)

Foreign Trade

The widespread distribution of domestic crushed stone deposits and the high cost of transportation limits foreign trade mostly to local transactions across international boundaries. U.S. imports and exports are small, representing less than 0.5% of the domestic consumption. However, shipments of crushed stone by water from Canada and especially Mexico are increasing.

Exports.—Exports of crushed stone increased 7.3% to 5.2 million tons compared with that of 1993, while value decreased 3% to \$38.1 million. About 96.3% of the exported crushed stone was limestone, Canada being the major destination with 87.8% of the total crushed stone exported. (See table 22.)

Imports.—Imports of crushed stone increased 5.8% to 8.9 million tons compared with that of 1993, while the value increased 4.7% to \$77.8 million. About 93.5% of the imported crushed stone was limestone.

Imports of natural calcium carbonate fines decreased significantly from 44,000 tons to 5,000 tons. (See table 23.)

Shipments of crushed stone from the Bahamas, Canada, and Mexico into the United States continued in 1993. The imported crushed stone was used mostly as construction aggregates or for cement manufacturing. This

trend is expected to continue, and the volume of imports, especially from Mexico, to increase.

Outlook

The demand for crushed stone in 1995 is expected to be about 1.3 billion tons, a 5% increase compared with that of 1994. Gradual increases in demand for construction aggregates are anticipated after 1995 as well, based on the volume of work on the infrastructure that is being financed by the Intermodal Surface Transportation Efficiency Act of 1991 and the U.S. economy in general. The projected increases will be influenced by construction activity primarily in the public as well as the private construction sector.

Crushed stone f.o.b. prices are not expected to increase significantly. However, the delivered prices of crushed stone are expected to increase, especially in and near metropolitan areas, mainly because more aggregates are transported from distant sources.

OTHER SOURCES OF INFORMATION

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Industrial Minerals.

Industrial Minerals and Rocks, 6th edition, American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc. 1994.

Pit & Quarry.

Quarry Management.

Rock Products.

Stone Review.

TABLE 1
SALIENT U.S. CRUSHED STONE STATISTICS 1/

	1990	1991	1992	1993	1994
Sold or used by producers:					
Quantity 2/ thousand metric tons	1,110,000	997,000	1,050,000	1,120,000	1,230,000
Value 2/ thousands	\$5,590,000 e/	\$5,140,000	\$5,590,000 e/	\$5,930,000 r/	\$6,620,000
Exports value, thousands	\$41,400	\$33,000	\$43,400	\$39,300	\$38,100
Imports3/ do.	\$35,300	\$38,600	\$60,700	\$74,300	\$77,800

e/Estimated. r/Revised.

1/Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits.

2/Does not include American Samoa, Guam, Puerto Rico, and the U.S. Virgin Islands.

3/Excludes precipitated calcium carbonate.

TABLE 2
CRUSHED STONE SOLD OR USED IN THE UNITED STATES, BY KIND 1/

Kind	1993 r/				1994			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	2,090	711,000	\$3,480,000	\$4.90	2,070	788,000	\$3,940,000	\$5.00
Dolomite	160	81,300	438,000	5.38	174	92,700	479,000	5.17
Marble	36	3,490	73,900	21.17	45	6,090	65,100	10.68
Calcareous marl	13	5,280	26,400	4.99	16	6,190	32,200	5.20
Shell	15	1,990	12,500	6.27	11	1,790	10,300	5.75
Granite	469	168,000	1,010,000	6.04	398	178,000	1,120,000	6.29
Traprock	600	87,600	535,000	6.11	591	91,000	576,000	6.33
Sandstone and quartzite	230	32,500	194,000	5.96	230	34,300	212,000	6.18
Slate	13	2,090	14,100	6.73	15	2,730	18,900	6.94
Volcanic cinder and scoria	126	2,380	14,500	6.10	133	2,060	12,600	6.13
Miscellaneous stone	165	22,900	129,000	5.61	224	25,600	150,000	5.85
Total	XX	1,120,000	5,930,000	5.30	XX	1,230,000	6,620,000	5.39

r/ Revised. XX Not applicable.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits, except prices; may not add to totals shown.

2/ Includes "Limestone-dolomite," reported with no distinction between the two.

TABLE 3
CRUSHED STONE 1/ SOLD OR USED IN THE UNITED STATES, BY REGION 2/

(Thousand metric tons and thousand dollars)

Region	1993		1994	
	Quantity	Value	Quantity	Value
Northeast:				
New England	21,800	169,000	26,100	207,000
Middle Atlantic	126,000	788,000	136,000	854,000
Midwest:				
East North Central	208,000	923,000	230,000	1,040,000
West North Central	124,000	602,000	150,000	758,000
South:				
South Atlantic	270,000 r/	1,560,000 r/	293,000	1,750,000
East South Central	124,000	637,000	140,000	697,000
West South Central	123,000 r/	526,000 r/	130,000	572,000
West:				
Mountain	37,200 r/	209,000 r/	35,800	199,000
Pacific	83,300 r/	516,000 r/	87,600	541,000
Total	1,120,000	5,930,000 r/	1,230,000	6,620,000

r/ Revised.

1/ Includes volcanic cinder and scoria.

2/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

TABLE 4
CRUSHED STONE SOLD OR USED BY PRODUCERS IN THE UNITED STATES IN 1994,
BY QUARTER AND REGION 1/

(Thousand metric tons and thousand dollars)

Region	Quantity 1st quarter	Percent change 2/	Quantity 2nd quarter	Percent change 2/	Quantity 3rd quarter	Percent change 2/	Quantity 4th quarter	Percent change 2/	Total 3/	Value total 3/
Northeast:										
New England	900	-10.5	6,300	2.2	7,900	5.3	7,100	10.6	22,200	176,700
Middle Atlantic	11,700	-11.9	38,100	4.5	45,700	7.4	38,100	18.2	133,600	858,200
Midwest:										
East North Central	25,000	5.7	64,800	13.8	71,700	5.2	64,500	9.2	226,000	1,032,200
West North Central	22,100	20.4	36,500	11.8	42,500	10.9	33,900	0.1	134,900	673,000
South:										
South Atlantic	54,900	10.6	82,000	11.2	85,000	13.3	78,700	16.1	300,600	1,788,200
East South Central	23,800	10.7	37,700	13.7	41,400	13.1	37,300	15.7	140,300	744,800
West South Central	30,000	17.7	33,700	7.8	37,300	9.4	31,400	9.4	132,400	582,400
West:										
Mountain	6,700	-1.4	9,900	-2.8	11,300	-7.4	9,000	9.6	36,800	213,600
Pacific 4/	15,600	23.0	18,700	11.5	20,600	0.2	19,700	-2.6	74,600	471,200
Total 3/	190,700	10.6	327,600	10.2	363,500	8.5	319,700	10.7	1,224,600 5/	6,724,600 5/

1/ As published in the "Crushed Stone and Sand and Gravel in the Fourth Quarter of 1994" Mineral Industry Survey.

2/ All percentage changes are calculated using unrounded totals.

3/ Data may not add to totals shown because of independent rounding, and differences between projected totals by States and by regions.

4/ Does not include Alaska and Hawaii.

5/ Includes Alaska, Hawaii, and "Other;" see table 6.

TABLE 5
CRUSHED STONE SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY STATE 1/ 2/

State	1993			1994		
	Quantity (thousand metric tons)	Value (thousands)	Unit value	Quantity (thousand metric tons)	Value (thousands)	Unit value
Alabama	28,900	\$176,000	\$6.08	32,500	\$164,000	\$5.07
Alaska 3/	3,530 r/ 4/	25,000 r/ 4/	7.07	3,870	24,100	6.24
Arizona	6,240 r/	35,600 r/	5.71	4,970	25,000	5.03
Arkansas	22,200 r/ 5/	108,000 5/ 6/	4.86	20,800 6/ 7/	122,000 6/ 7/	5.83
California	38,700 r/	252,000 r/	6.51	41,100	258,000	6.29
Colorado	10,300	62,000	5.96	8,600	53,600	6.23
Connecticut	4,600 4/ 8/	39,500 4/ 8/	8.59	5,710	51,000	8.93
Florida	64,900	313,000 9/	4.83	67,000	343,000	5.13
Georgia	49,400	292,000	5.92	54,600	331,000	6.07
Hawaii	8,460 8/	81,400 8/	9.63	8,170	82,300	10.08
Idaho	4,600	20,800	4.51	4,160	20,300	4.89
Illinois	61,500 4/	315,000 4/	5.13	62,600 8/	353,000 8/	5.64
Indiana	36,900	166,000	4.50	45,900	211,000	4.61
Iowa	30,500	169,000	5.53	36,600 8/	211,000 5/ 8/	5.75
Kansas	18,800 4/	90,700 4/	4.81	21,500	103,000	4.82
Kentucky	49,000 4/	226,000 4/	4.61	56,300	259,000	4.61
Louisiana	W	W 7/ 8/ 10/	10.91 r/	707 8/ 10/	7,710 8/ 10/	10.91
Maine	1,830	10,400	5.65	2,740	15,500	5.65
Maryland	21,000 r/	139,000 r/	6.60	24,100 8/	162,000 8/	6.73
Massachusetts	9,460 5/ 8/	76,300 5/ 8/	8.07	10,500	97,300	9.29
Michigan	31,000	112,000	3.60	35,000	113,000	3.23
Minnesota	9,420	37,700	4.00	10,900	47,100	4.33
Mississippi	2,100	8,120	3.86	1,900	7,500	3.95
Missouri	53,400	239,000	4.48	68,900	330,000	4.80
Montana	2,820	10,400	3.68	2,320	8,830	3.80
Nebraska	6,760	38,900	5.75	6,890	41,600	6.04
Nevada	1,610	12,500	7.80	2,310	20,600	8.93
New Hampshire	1,390	7,790	5.61	1,390 7/	7,470 7/	5.39
New Jersey	16,700 4/ 7/	138,000 4/ 7/	8.25	19,800	154,000	7.80
New Mexico	3,580 r/	19,000 r/	5.31	3,550 6/ 11/	20,000 6/ 11/	5.62
New York	38,400	223,000 6/	5.81	39,400	239,000	6.05
North Carolina	47,800 11/ 12/ 13/ A: F	298,000 11/ 12/ 13/	6.23	53,900	351,000	6.51
North Dakota	W 13/	W 13/	W 13/	--	--	--
Ohio	51,800 r/	227,000 r/	4.37	56,400	251,000	4.45
Oklahoma	27,100	114,000	4.21	29,900	125,000	4.18
Oregon	18,900	84,700	4.48	18,900	90,100	4.76
Pennsylvania	70,100 r/	409,000 r/	5.83	76,700	462,000	6.02
Rhode Island	1,290	9,250	7.17	1,610	12,200	7.58
South Carolina	19,800	121,000	6.12	20,000 14/	128,000 14/	6.39
South Dakota	4,230 4/ 8/	18,700 4/ 8/	4.42	5,470 8/	24,500 8/	4.47
Tennessee	43,500	227,000	5.20	49,200	265,000	5.39
Texas	71,700 r/	281,000 r/	3.96	76,100	300,000	3.95
Utah	4,560	29,400	6.45	4,540	19,800	4.37
Vermont	2,520	12,900	5.12	4,170	23,700	5.68
Virginia	51,000	292,000	5.73	56,700	327,000	5.77
Washington	13,200	68,600	5.20	15,500	86,100	5.54
West Virginia	10,300 5/	79,700	7.72	12,300 5/	99,300	8.10
Wisconsin	26,200	98,000	3.73	28,500	114,000 11/	4.01
Wyoming	3,460	19,800	5.74	5,080	30,000	5.91
Other	12,400 r/	98,000 r/	7.92	8,800	24,700	2.81
Total	1,120,000	5,930,000 r/	5.29	1,230,000	6,620,000	5.39

r/ Revised. W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits, except prices; may not add to totals shown.

2/ To avoid disclosing company proprietary data, certain State totals do not include all kinds of stone produced within the State; the portion not shown has been included with "Other."

3/ Data derived in part from the Alaska Geological Survey.

4/ Excludes sandstone.

5/ Excludes dolomite.

6/ Excludes traprock.

7/ Excludes limestone.

8/ Excludes other.

9/ Excludes limestone-dolomite.

10/ Excludes shell.

11/ Excludes quartzite.

12/ Excludes slate.

13/ Excludes volcanic cinder.

14/ Excludes marble.

TABLE 6
CRUSHED STONE SOLD OR USED BY PRODUCERS IN THE UNITED STATES IN 1994,
BY QUARTER AND STATE 1/

(Thousand metric tons and thousand dollars)

State	Quantity 1st quarter	Percent change 2/	Quantity 2nd quarter	Percent change 2/	Quantity 3rd quarter	Percent change 2/	Quantity 4th quarter	Percent change 2/	Total	Value total
Alabama	6,600	14.3	8,200	4.4	8,600	5.6	8,200	15.4	31,600	193,700
Alaska 4/	--	--	--	--	--	--	--	--	2,500	11,900
Arizona	1,500	3.1	1,600	3.2	1,800	-2.0	1,700	8.7	6,600	38,300
Arkansas 5/	4,600	7.2	6,500	15.7	8,000	26.4	6,200	12.0	25,300	122,700
California	9,000	33.2	9,600	5.6	10,300	-5.7	10,500	-7.1	39,400	262,000
Colorado	1,500	-14.0	2,500	-12.3	2,800	-21.2	2,100	-7.9	8,900	54,300
Connecticut 5/	200	42.8	1,300	1.3	2,100	27.0	1,800	15.9	5,400	47,300
Delaware 4/	--	--	--	--	--	--	--	--	--	--
Florida	17,800	10.2	19,200	14.8	19,800	23.9	18,400	14.2	75,200	376,000
Georgia	10,900	14.8	14,500	6.3	15,200	7.4	14,400	18.9	55,000	330,000
Hawaii 4/ 5/	--	--	--	--	--	--	--	--	8,700	84,000
Idaho 6/	--	--	--	--	--	--	--	--	3,700	17,000
Illinois 5/	7,600	7	18,900	13.9	21,400	5.9	19,100	8.0	67,000	355,100
Indiana	6,300	22.7	12,600	30.3	12,600	6.5	12,200	19.3	43,700	205,400
Iowa	4,100	8.9	8,700	-3.8	9,300	-2.1	7,500	-8.5	29,600	165,800
Kansas 5/	3,900	11.2	5,300	6.6	6,400	19.5	4,300	-13.3	19,900	98,500
Kentucky 5/	8,600	-1.1	15,200	19.6	16,200	10.9	14,300	10.5	54,300	260,600
Louisiana 5/ 6/	--	--	--	--	--	--	--	--	--	--
Maine	200	-14.0	600	8.0	700	44.1	600	2.4	2,100	12,300
Maryland	3,200	10.9	7,000	7.2	7,600	9.8	7,500	12.2	25,300	172,000
Massachusetts 5/	200	-31.8	2,800	-1.8	2,800	-19.6	2,700	-5.0	8,500	68,900
Michigan	1,800	-7.1	8,900	-6.2	10,800	3.1	10,900	19.9	32,400	118,300
Minnesota	600	47.3	2,800	12.7	4,100	2.0	2,800	9.9	10,300	44,800
Mississippi 6/	--	--	--	--	--	--	--	--	1,800	7,000
Missouri	12,800	33.4	16,400	21.9	19,200	34.0	17,900	11.9	66,300	314,900
Montana	300	-19.3	700	11.3	600	-51.7	500	-7.7	2,100	8,000
Nebraska	1,300	22.5	2,000	30.4	2,200	-13.0	1,400	-10.8	6,900	40,700
Nevada	400	6.4	700	78.6	100	-61.1	500	7.1	1,700	13,400
New Hampshire	100	32.6	500	45.6	700	37.4	800	86.9	2,100	12,200
New Jersey 5/	1,400	-34.3	5,100	8.7	5,600	13.1	6,100	20.8	18,200	153,800
New Mexico 5/	600	3.4	900	14.1	1,100	2.2	700	-29.6	3,300	18,000
New York	2,700	-17.2	11,300	-2.4	15,100	8.7	10,000	4.1	39,100	228,700
North Carolina 5/	9,400	10.8	14,600	7.3	15,200	9.8	13,700	15.5	52,900	343,900
North Dakota 5/ 6/	--	--	--	--	--	--	--	--	--	--
Ohio	6,700	-1.8	16,300	15.8	17,000	2.3	13,800	-5.1	53,900	250,600
Oklahoma	7,200	21.2	7,500	3.5	8,700	26.0	7,900	12.3	31,300	139,300
Oregon	3,700	7.2	4,700	5.2	5,900	9.7	5,400	-3.4	19,700	92,600
Pennsylvania 5/	7,700	-2.5	21,800	7.8	25,000	5.1	22,000	26.0	76,500	455,200
Rhode Island 6/	--	--	--	--	--	--	--	--	1,700	12,300
South Carolina	4,400	10.4	5,900	6.4	5,600	8.2	5,300	3.1	21,200	132,300
South Dakota 5/	500	-16.8	1,400	25.2	1,300	-8.7	1,100	4.0	4,300	19,600
Tennessee	7,900	23.5	14,100	17.4	16,400	22.6	14,400	21.9	52,800	287,800
Texas	18,000	18.5	19,800	7.9	20,800	-1.3	17,300	7.2	75,900	315,000
Utah	1,500	27.4	1,000	-13.7	1,800	56.7	1,300	22.8	5,600	37,500
Vermont 6/	--	--	--	--	--	--	--	--	2,600	13,900
Virginia	8,200	3.3	17,300	20.4	17,400	14.3	16,200	21.1	59,100	351,600
Washington	2,800	11.8	4,600	47.1	4,600	6.3	3,900	21.2	15,900	86,700
West Virginia 5/	1,800	16.4	4,000	37.9	5,000	52.3	3,600	43.3	14,400	114,500
Wisconsin	2,400	-15.9	7,900	15.1	10,100	11.8	7,900	5.6	28,300	114,600
Wyoming	400	2.9	1,200	-6.2	1,500	24.2	1,100	92.8	4,200	25,000
Other	--	--	--	--	--	--	--	--	12,000	96,600
Total 3/	XX	XX	XX	XX	XX	XX	XX	XX	1,224,600	6,724,600

XX Not applicable.

1/ As published in the "Crushed Stone and Sand and Gravel in the Fourth Quarter of 1994" Mineral Industry Survey.

2/ All percentage change are calculated using unrounded totals.

3/ Data may not add to totals shown because of independent rounding, and differences between projected totals by States and by regions.

4/ State not included in quarterly survey.

5/ To avoid disclosing company proprietary data, certain State totals do not include all kinds of stone produced within the State; the portion not shown has been included with "Other."

6/ Due to low number of companies, no production estimates by quarter were generated.

TABLE 7
CRUSHED STONE SOLD OR USED IN THE UNITED STATES IN 1994,
BY REGION AND SIZE OF OPERATION 1/

Size range (Metric tons)	Northeast				Midwest				South			
	Number of operations	Percent of total	Quantity (thousand metric tons)	Percent of total	Number of operations	Percent of total	Quantity (thousand metric tons)	Percent of total	Number of operations	Percent of total	Quantity (thousand metric tons)	Percent of total
Less than 25,000	54	12.0	390	--	226	19.0	2,060	--	69	7.0	736	--
25,000 to 49,999	14	3.0	466	--	127	10.0	4,200	1.0	44	4.0	1,490	--
50,000 to 99,999	40	9.0	2,760	1.0	155	13.0	10,500	2.0	78	8.0	5,310	--
100,000 to 199,999	67	15.0	9,220	5.0	184	15.0	24,300	6.0	116	12.0	15,700	2.0
200,000 to 299,999	52	12.0	11,900	7.0	120	10.0	26,800	7.0	90	9.0	20,200	3.0
300,000 to 399,999	43	10.0	13,300	8.0	77	6.0	24,400	6.0	65	6.0	20,800	3.0
400,000 to 499,999	34	8.0	14,000	8.0	67	5.0	27,400	7.0	67	7.0	27,300	4.0
500,000 to 599,999	21	4.0	10,500	6.0	28	2.0	13,900	3.0	68	7.0	33,900	6.0
600,000 to 699,999	15	3.0	8,780	5.0	24	2.0	14,100	3.0	54	5.0	32,000	5.0
700,000 to 799,999	15	3.0	10,300	6.0	27	2.0	18,300	4.0	45	4.0	30,500	5.0
800,000 to 899,999	18	4.0	13,800	8.0	26	2.0	20,100	5.0	35	3.0	27,300	4.0
900,000 to 999,999	11	2.0	9,460	5.0	23	1.0	19,900	5.0	30	3.0	26,000	4.0
1,000,000 to 1,499,999	29	6.0	30,500	18.0	52	4.0	57,300	15.0	107	11.0	119,000	21.0
1,500,000 to 1,999,999	5	1.0	7,710	4.0	21	1.0	32,600	8.0	42	4.0	67,400	12.0
2,000,000 to 2,499,999	--	--	--	--	10	--	20,500	5.0	12	1.0	24,500	4.0
2,500,000 to 4,999,999	7	1.0	18,800	11.0	11	--	34,100	9.0	22	2.0	65,600	11.0
5,000,000 and over	--	--	--	--	5	--	29,600	7.0	6	--	45,300	8.0
Total	425	100.0	162,000	100.0	1,180	100.0	380,000	100.0	950	100.0	563,000	100.0
	West				U.S. total							
	Number of operations	Percent of total	Quantity (thousand metric tons)	Percent of total	Number of operations	Percent of total	Quantity (thousand metric tons)	Percent of total				
Less than 25,000	232	34.0	1,730	1.0	581	17.0	4,910	--				
25,000 to 49,999	97	14.0	3,270	2.0	282	8.0	9,430	--				
50,000 to 99,999	109	16.0	7,060	5.0	382	11.0	25,700	2.0				
100,000 to 199,999	88	12.0	11,500	9.0	455	14.0	60,700	4.0				
200,000 to 299,999	43	6.0	9,560	7.0	305	9.0	68,500	5.0				
300,000 to 399,999	26	3.0	8,080	6.0	211	6.0	66,600	5.0				
400,000 to 499,999	18	2.0	7,170	6.0	186	5.0	76,000	6.0				
500,000 to 599,999	8	1.0	3,870	3.0	125	3.0	62,100	5.0				
600,000 to 699,999	10	1.0	5,910	4.0	103	3.0	60,800	5.0				
700,000 to 799,999	11	1.0	7,560	6.0	98	3.0	66,600	5.0				
800,000 to 899,999	7	1.0	5,410	4.0	86	2.0	66,600	5.0				
900,000 to 999,999	6	--	5,160	4.0	70	2.0	60,500	4.0				
1,000,000 to 1,499,999	8	1.0	8,570	6.0	196	6.0	215,000	17.0				
1,500,000 to 1,999,999	7	1.0	10,700	8.0	75	2.0	118,000	9.0				
2,000,000 to 2,499,999	7	1.0	13,800	11.0	29	--	58,900	4.0				
2,500,000 to 4,999,999	5	--	13,900	11.0	45	1.0	132,000	10.0				
5,000,000 and over	--	--	--	--	11	0.9	74,900	6.0				
Total	682	100.0	123,000	100.0	3,240	100.0	1,230,000	100.0				

1/ Data rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

TABLE 8
CRUSHED LIMESTONE AND DOLOMITE SOLD OR USED BY PRODUCERS IN
THE UNITED STATES IN 1994, BY STATE 1/

(Thousand metric tons and thousand dollars)

State	Limestone		Dolomite	
	Quantity	Value	Quantity	Value
Alabama	28,300 2/	117,000 2/	W	W
Arizona	2,710	10,500	--	--
Arkansas	6,870	33,500	W	W
California	23,300	149,000	208	1,550
Colorado	2,550	13,900	--	--
Connecticut	W	W	408	W
Florida	64,200 2/	330,000 2/	W	W
Georgia	5,090 2/	31,000 2/	--	--
Hawaii	W	10,500	--	--
Idaho	W	1,400	--	--
Illinois	47,600 2/	276,000 2/	W	W
Indiana	40,000 2/	183,000 2/	5,840	28,000
Iowa	36,600 2/	211,000 2/	33	--
Kansas	20,600 2/	98,500 2/	--	--
Kentucky	56,100 2/	257,000 2/	--	--
Maine	1,530	9,450	--	--
Maryland	16,900	114,000	--	--
Massachusetts	1,710 2/	19,000 2/	W	W
Michigan	27,900 2/	90,000 2/	6,810	22,200
Minnesota	7,670	32,700	W	W
Mississippi	W	W	--	--
Missouri	64,400 2/	303,000 2/	2,960	13,600
Montana	1,410	6,010	--	--
Nebraska	6,890	41,600	--	--
Nevada	W	13,000	W	W
New Hampshire	W	W	--	--
New Jersey	W	W	--	--
New Mexico	1,880	8,660	--	--
New York	27,400 2/	142,000 2/	7,540	55,800
North Carolina	W	W	245	1,680
Ohio	41,700 2/	190,000	14,500	59,900
Oklahoma	22,600	91,200	1,820	7,550
Oregon	W	W	--	--
Pennsylvania	44,000 2/	256,000	14,700	90,000
Rhode Island	W	W	--	--
South Carolina	W	W	--	--
South Dakota	2,850	9,520	--	--
Tennessee	43,500 2/	237,000	W	W
Texas	72,000	285,000	W	W
Utah	1,980 2/	12,300	W	W
Vermont	1,800	11,200	234	1,220
Virginia	16,300	89,800	3,650	27,800
Washington	2,140 2/	23,600 2/	W	W
West Virginia	10,200	66,000	W	19,200
Wisconsin	21,900 2/	89,200 2/	W	W
Wyoming	1,520 2/	6,120 2/	--	--
Other	14,000 2/	73,300 2/	33,800	151,000
Total	788,000	3,940,000	92,700	479,000

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Includes "limestone/dolomite," reported with no distinction between the two.

TABLE 9
CRUSHED CALCAREOUS MARL AND MARBLE SOLD OR USED BY
PRODUCERS IN THE UNITED STATES IN 1994, BY STATE 1/

(Thousand metric tons and thousand dollars)

State	Calcareous Marl		Marble	
	Quantity	Value	Quantity	Value
Alabama	--	--	W	W
Arizona	--	--	593	3,730
Florida	W	W	--	--
Georgia	W	W	W	W
Maine	W	W	--	--
Michigan	W	W	--	--
Mississippi	26	203	--	--
New York	--	--	87	1,610
North Carolina	111	738	--	--
Pennsylvania	--	--	476	3,210
South Carolina	3,220	21,500	W	W
Texas	W	W	W	W
Vermont	--	--	839	4,730
Washington	--	--	W	W
Wyoming	--	--	93	3,250
Other	2,840	9,750	4,010	48,600
Total	6,190	32,200	6,090	65,100

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

TABLE 10
CRUSHED GRANITE, TRAPROCK, AND SANDSTONE AND QUARTZITE SOLD OR USED BY PRODUCERS
IN THE UNITED STATES IN 1994, BY STATE 1/

(Thousand metric tons and thousand dollars)

State	Granite		Traprock		Sandstone and quartzite	
	Quantity	Value	Quantity	Value	Quantity	Value
Alabama	W	W	--	--	--	--
Alaska 2/	W	W	1,280	5,520	W	W
Arizona	1,330	7,870	W	W	W	W
Arkansas	7,090	52,600	W	W	5,290	25,300
California	4,880	23,400	6,090	43,500	1,120	6,310
Colorado	3,180	16,500	--	--	W	W
Connecticut	119	1,350	3,750	30,100	--	--
Georgia	47,200	287,000	--	--	W	W
Hawaii	--	--	6,150	61,100	--	--
Idaho	281	1,110	2,230	9,440	556	4,800
Illinois	--	--	--	--	W	W
Kansas	--	--	--	--	W	W
Kentucky	--	--	--	--	W	W
Louisiana	--	--	--	--	707	7,710
Maine	W	W	W	W	--	--
Maryland	4,940	31,600	W	W	242	2,000
Massachusetts	2,850	W	5,860	48,700	--	--
Michigan	--	--	19	43	W	W
Minnesota	W	W	W	W	W	W
Missouri	W	W	--	--	W	W
Montana	W	W	W	W	W	W
Nevada	W	W	W	W	--	--
New Hampshire	1,060	5,070	W	W	--	--
New Jersey	7,460	58,200	10,600	78,600	W	W
New Mexico	1,250	8,620	W	W	W	W
New York	2,430	20,400	W	W	798	5,420
North Carolina	41,300	265,000	3,930	25,800	W	W
Ohio	--	--	--	--	232	832
Oklahoma	W	W	W	W	W	W
Oregon	54	235	15,200	71,500	W	W
Pennsylvania	2,570	15,800	2,650	21,700	7,030	45,500
Rhode Island	W	W	W	W	--	--
South Carolina	15,200	97,600	--	--	--	--
South Dakota	--	--	--	--	2,620	15,000
Tennessee	W	W	--	--	W	W
Texas	4	W	W	W	524	3,840
Utah	--	--	--	--	189	1,190
Vermont	W	W	--	--	W	W
Virginia	22,200	127,000	12,700	71,800	1,330	7,460
Washington	234	1,030	10,700	47,900	W	W
West Virginia	--	--	--	--	2,070	14,100
Wisconsin	1,200	2,340	W	W	W	W
Wyoming	3,410	W	--	--	W	W
Other	7,990	97,800	9,780	59,900	11,600	72,400
Total	178,000	1,120,000	91,000	576,000	34,300	212,000

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Data derived in part from the Alaska Geological Survey.

TABLE 11
CRUSHED VOLCANIC CINDER AND SCORIA AND CRUSHED
MISCELLANEOUS STONE 1/ SOLD OR USED BY PRODUCERS
IN THE UNITED STATES IN 1994, BY STATE 2/

(Thousand metric tons and thousand dollars)

State	Volcanic cinder and scoria		Miscellaneous stone	
	Quantity	Value	Quantity	Value
Alabama	--	--	W	W
Alaska 3/	--	--	2,480	18,000
Arizona	45	94	W	W
Arkansas	--	--	1,580	10,200
California	487	2,100	4,960	32,800
Colorado	W	W	W	W
Florida	--	--	1,820	7,930
Georgia	--	--	W	W
Hawaii	143	1,080	876	9,650
Idaho	W	W	679	3,520
Illinois	--	--	W	W
Iowa	--	--	W	W
Louisiana	--	--	W	W
Maine	--	--	W	W
Maryland	--	--	W	W
Massachusetts	--	--	W	W
Michigan	--	--	W	W
Mississippi	--	--	26	203
Montana	5	12	W	W
Nevada	54	W	W	W
New Mexico	285	2,000	W	W
New York	--	--	W	W
North Carolina	W	W	3,590	24,700
Oklahoma	--	--	W	W
Oregon	W	W	2,650	13,700
Pennsylvania	--	--	5,310	29,300
South Carolina	--	--	3,220	W
South Dakota	--	--	W	W
Tennessee	--	--	W	W
Texas	W	W	2,630	6,530
Utah	4	4	--	--
Vermont	--	--	W	W
Virginia	--	--	563	W
Washington	W	W	475	2,560
Wyoming	W	W	W	W
Other	1,030	7,320	5,430	52,000
Total	2,060	12,600	36,300	211,000

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Includes marl, shell, slate, and other stone.

2/ Data rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

3/ Data derived in part from the Alaska Geological Survey.

TABLE 12
KIND OF CRUSHED STONE PRODUCED IN THE UNITED STATES IN 1994, BY STATE

State	Lime- stone	Dolo- mite	Marble	Marl	Shell	Granite	Trap- rock	Sand- stone	Quartzite	Slate	Volcanic cinder and scoria	Miscella- neous
Alabama	X	X	X			X				X		
Alaska 1/						X	X	X		X		X
Arizona	X		X			X	X	X	X		X	X
Arkansas	X	X				X	X	X				X
California	X	X			X	X	X	X	X	X	X	X
Colorado	X					X		X			X	X
Connecticut	X	X				X	X					
Florida	X	X		X	X							
Georgia	X		X	X		X			X			
Hawaii	X						X				X	X
Idaho	X				X	X	X		X		X	X
Illinois	X	X										X
Indiana	X	X										
Iowa	X	X										X
Kansas	X							X	X			
Kentucky	X							X				
Louisiana					X			X				X
Maine	X			X		X	X			X		X
Maryland	X					X	X	X				X
Massachusetts	X	X				X	X					X
Michigan	X	X		X			X	X				X
Minnesota	X	X				X	X	X	X			
Mississippi	X			X								
Missouri	X	X				X		X				
Montana	X					X	X	X	X		X	X
Nebraska	X											
Nevada	X	X				X	X				X	X
New Hampshire	X					X	X					
New Jersey	X					X	X	X				X
New Mexico	X					X	X	X	X		X	X
New York	X	X	X			X	X	X		X		
North Carolina	X	X		X		X	X		X	X	X	X
Ohio	X	X						X				
Oklahoma	X	X				X	X	X		X		X
Oregon	X				X	X	X	X	X	X	X	X
Pennsylvania	X	X	X			X	X	X	X			X
Rhode Island	X					X	X					
South Carolina	X		X	X		X						
South Dakota	X								X			X
Tennessee	X	X				X		X				X
Texas	X	X	X	X		X	X	X			X	X
Utah	X	X						X	X		X	
Vermont	X	X	X			X			X	X		
Virginia	X	X				X	X	X	X	X		X
Washington	X	X	X			X	X	X			X	X
West Virginia	X	X						X				
Wisconsin	X	X				X	X	X	X			
Wyoming	X		X			X			X		X	X

1/ Data derived in part from the Alaska Geological Survey.

TABLE 13
CRUSHED STONE SOLD OR USED BY PRODUCERS IN THE UNITED
STATES IN 1994, BY USE 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	5,260	\$26,500	\$5.05
Riprap and jetty stone	23,300	127,000	5.44
Filter stone	7,780	42,200	5.43
Other coarse aggregate	7,450	40,700	5.46
Coarse aggregate, graded:			
Concrete aggregate, coarse	112,000	627,000	5.58
Bituminous aggregate, coarse	89,600	511,000	5.70
Bituminous surface-treatment aggregate	21,300	128,000	6.00
Railroad ballast	16,300	88,100	5.41
Other graded coarse aggregate	24,100	141,000	5.84
Fine aggregate (-3/8 inch):			
Stone sand, concrete	23,100	130,000	5.63
Stone sand, bituminous mix or seal	23,800	128,000	5.37
Screening, undesignated	29,700	141,000	4.75
Other fine aggregate	4,550	26,800	5.89
Coarse and fine aggregates:			
Graded road base or subbase	181,000	800,000	4.41
Unpaved road surfacing	29,200	139,000	4.75
Terrazzo and exposed aggregate	2,430	20,600	8.48
Crusher run or fill or waste	48,400	209,000	4.32
Other coarse and fine aggregates	27,700	160,000	5.77
Roofing granules	4,230	48,500	11.47
Other construction materials 2/	10,600	66,000	6.25
Agricultural:			
Agricultural limestone	13,600	91,400	6.73
Poultry grit and mineral food	2,040	27,100	13.26
Other agricultural uses	1,280	6,790	5.29
Chemical and metallurgical:			
Cement manufacture	85,200	303,000	3.55
Lime manufacture	17,800	92,800	5.21
Dead-burned dolomite manufacture	526	1,680	3.20
Flux stone	4,990	26,700	5.36
Chemical stone	779	3,800	4.88
Glass manufacture	680	7,150	10.52
Sulfur oxide removal	2,680	13,300	4.96
Special:			
Mine dusting or acid water treatment	479	9,070	18.94
Asphalt fillers or extenders	1,780	16,900	9.53
Whiting or whiting substitute	1,810	75,500	41.71
Other fillers or extenders	4,500	98,700	21.95
Other miscellaneous uses:			
Abrasives	W	W	6.13
Flour (slate)	W	W	44.09
Sugar refining	W	W	10.18
Other specified uses not listed 3/	1,660	10,900	5.70
Unspecified: 4/			
Actual	263,000	1,470,000	5.59
Estimated	133,000	766,000	5.75
Total	1,230,000	6,620,000	5.39

W Withheld to avoid disclosing company proprietary data; included with "Other specified uses not listed."

1/ Data rounded by the U.S. Bureau of Mines to three significant digits, except prices; may not add to totals shown.

2/ Includes building products, drain fields, pipe bedding and waste material.

3/ Includes disinfectant and animal sanitation, flour (slate), and sugar refining.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 14
CRUSHED LIMESTONE 1/ AND DOLOMITE SOLD OR USED BY PRODUCERS IN THE
UNITED STATES IN 1994, BY USE 2/

(Thousand metric tons and thousand dollars)

Use	Limestone		Dolomite	
	Quantity	Value	Quantity	Value
Coarse aggregate (+1 1/2 inch):				
Macadam	2,100	9,820	1,420	6,860
Riprap and jetty stone	16,400	78,500	1,230	6,960
Filter stone	5,420	27,400	193	1,240
Other coarse aggregate	3,910	19,200	319	1,510
Coarse aggregate, graded:				
Concrete aggregate, coarse	73,700	384,000	13,100	69,500
Bituminous aggregate, coarse	54,400	282,000	11,300	64,200
Bituminous surface-treatment aggregate	13,600	73,100	2,350	14,400
Railroad ballast	4,510	19,300	1,740	8,010
Other graded coarse aggregate	11,200	59,900	5,870	29,100
Fine aggregate (-3/8 inch):				
Stone sand, concrete	13,900	72,500	3,920	16,900
Stone sand, bituminous mix or seal	14,800	71,200	3,000	17,900
Screening, undesignated	18,600	84,000	2,230	11,300
Other fine aggregate	2,270	11,600	680	4,420
Coarse and fine aggregates:				
Graded road base or subbase	118,000	485,000	16,000	73,200
Unpaved road surfacing	16,500	84,800	6,300	26,400
Terrazzo and exposed aggregate	1,460	9,880	73	289
Crusher run or fill or waste	29,500	121,000	3,360	11,400
Other coarse and fine aggregates	14,000	67,200	5,000	29,000
Roofing granules	397	3,600	--	--
Other construction materials 3/	3,890	21,900	315	1,540
Agricultural:				
Agricultural limestone	11,500	73,400	2,120	18,100
Poultry grit and mineral food	1,910	25,800	9	137
Other agricultural uses	620	3,040	165	1,270
Chemical and metallurgical:				
Cement manufacture	81,400	278,000	W	W
Lime manufacture	15,500	82,000	2,320	9,680
Dead-burned dolomite manufacture	151	374	376	1,310
Flux stone	2,170	9,770	2,190	10,900
Chemical stone	777	3,790	W	W
Glass manufacture	654	6,720	W	W
Sulfur oxide removal	2,630	13,100	W	W
Special:				
Mine dusting or acid water treatment	347	5,560	W	W
Asphalt fillers or extenders	1,040	11,500	686	4,950
Whiting or whiting substitute	1,650	68,100	W	W
Other fillers or extenders	3,080	72,400	379	5,400
Other miscellaneous uses:				
Abrasives	W	W	--	--
Sugar refining	W	W	--	--
Other uses not listed 4/	1,300	6,790	127	2,120
Unspecified: 5/				
Actual	158,000	822,000	3,350	19,700
Estimated	86,900	474,000	2,540	11,800
Total	788,000	3,940,000	92,700	479,000

W Withheld to avoid disclosing company proprietary data; included with "Other uses not listed."

1/ Includes a minor amount of limestone-dolomite reported without a distinction between the two.

2/ Data rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

3/ Includes building products, drain fields, pipe bedding, and waste material.

4/ Includes disinfectant and animal sanitation.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 15
CRUSHED LIMESTONE 1/ AND DOLOMITE SOLD OR USED BY PRODUCERS
IN 1994, BY STATE AND USE 2/

(Thousand metric tons and thousand dollars)

State	Concrete aggregate		Bituminous aggregate		Roadstone and coverings		Riprap and rail-road ballast		Other construction uses	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Alabama	4,320	16,900	6,050	24,400	3,590	14,600	901	4,560	4,530	19,200
Arizona	--	--	--	--	--	--	--	--	--	--
Arkansas	286	1,270	599	3,810	1,250	4,990	221	853	667	2,990
California	961	5,970	1,640	9,270	1,330	5,240	164	634	537	2,810
Colorado	--	--	--	--	--	--	--	--	W	W
Connecticut	27	W	73	W	--	--	--	--	136	W
Florida	17,000	113,000	7,740	45,200	14,700	56,300	W	W	9,940	43,700
Georgia	1,050	6,720	771	4,790	666	3,540	49	383	1,400	8,310
Hawaii	205	2,520	--	--	107	1,260	W	W	337	3,630
Idaho	--	--	--	--	--	--	--	--	--	--
Illinois	6,660	34,000	6,930	41,400	12,800	57,000	1,020	5,640	1,490	6,360
Indiana	5,290	20,600	5,100	21,000	7,370	34,200	1,440	6,280	2,720	12,400
Iowa	1,200	8,510	1,790	9,540	5,650	31,000	342	2,130	768	3,790
Kansas	844	4,960	1,180	7,320	2,940	13,400	W	W	2,000	10,400
Kentucky	4,010	19,500	9,310	44,700	11,500	51,600	4,710	19,900	7,000	27,200
Maine	W	825	--	--	--	--	--	--	--	--
Maryland	2,330	12,700	3,650	24,300	1,850	12,100	W	W	3,130	20,900
Massachusetts	--	--	W	W	W	W	--	W	W	W
Michigan	5,810	18,400	4,250	13,000	4,110	15,000	276	1,730	580	1,920
Minnesota	333	1,480	366	1,470	2,370	8,910	115	558	442	2,260
Mississippi	W	W	W	W	W	W	W	W	W	W
Missouri	3,730	25,800	4,220	22,700	13,800	57,900	4,350	15,000	4,340	20,400
Montana	--	--	--	--	--	--	W	W	--	9
Nebraska	763	5,400	W	W	526	3,770	271	2,240	705	4,250
Nevada	--	--	--	--	W	W	--	--	--	--
New Hampshire	W	W	--	--	--	--	W	W	--	--
New Jersey	W	W	W	W	W	W	--	--	W	W
New Mexico	261	1,290	97	129	229	380	W	W	58	160
New York	2,990	22,200	11,000	71,700	6,290	34,200	524	3,280	6,370	28,100
North Carolina	141	1,090	W	W	175	1,010	48	336	460	2,980
Ohio	9,540	37,500	4,080	18,000	14,200	58,900	2,610	10,200	1,800	7,330
Oklahoma	7,610	35,100	1,410	7,120	1,700	6,250	911	5,390	6,520	21,700
Oregon	--	--	--	--	--	--	--	--	--	--
Pennsylvania	6,610	38,300	14,000	86,500	11,900	61,900	811	5,090	6,560	38,200
Rhode Island	--	--	--	--	--	--	--	--	3	W
South Carolina	--	--	--	--	--	--	--	--	--	--
South Dakota	W	W	W	W	W	W	W	W	W	W
Tennessee	4,870	25,200	14,700	78,200	12,000	59,700	1,690	8,390	7,310	36,600
Texas	15,700	73,200	10,800	47,100	20,700	61,300	835	4,670	4,350	12,200
Utah	--	--	W	W	W	W	W	W	W	W
Vermont	76	418	W	W	153	769	--	--	W	W
Virginia	2,020	12,000	2,540	15,600	2,690	13,400	535	3,270	3,680	18,500
Washington	--	W	9	W	--	W	W	W	W	W
West Virginia	1,030	5,860	2,680	14,500	787	4,530	437	2,450	3,300	17,900
Wisconsin	1,400	6,180	1,310	5,920	7,560	27,900	W	W	1,300	5,560
Wyoming	W	W	W	W	W	W	W	W	W	W
Total	107,000	557,000	116,000	618,000	163,000	701,000	22,300	103,000	82,400	380,000
Total withheld	376	1,760	1,760	9,960	1,600	5,540	1,630	9,840	1,980	10,500
Grand total	107,000	559,000	118,000	628,000	165,000	706,000	23,900	113,000	84,400	390,000

See footnotes at end of table.

TABLE 15-Continued
CRUSHED LIMESTONE 1/ AND DOLOMITE SOLD OR USED BY PRODUCERS
IN 1994, BY STATE AND USE 2/

(Thousand metric tons and thousand dollars)

State	Cement manufacture		Agricultural uses		Lime manufacture		Other uses		Total	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Alabama	W	W	W	W	1,400	7,270	9,790	42,900	30,600	130,000
Arizona	W	W	W	W	--	--	2,710	10,500	2,710	10,500
Arkansas	W	W	255	2,410	W	W	4,840	22,100	8,120	38,400
California	12,600	43,900	W	W	W	W	6,250	82,300	23,500	150,000
Colorado	1,280	6,550	--	--	--	--	W	W	2,550	13,900
Connecticut	--	--	29	W	--	--	1,580	19,600	1,850	19,600
Florida	W	W	951	8,500	--	--	14,800	68,900	65,100	335,000
Georgia	W	W	W	W	--	--	W	W	5,090	31,000
Hawaii	278	2,170	W	W	--	--	73	884	1,000	10,500
Idaho	W	W	W	W	--	--	407	1,400	407	1,400
Illinois	2,130	7,540	2,300	10,900	--	--	29,200	190,000	62,600	353,000
Indiana	3,510	6,110	1,410	6,010	--	--	19,000	105,000	45,900	211,000
Iowa	2,810	20,100	1,190	10,600	W	W	22,900	125,000	36,600	211,000
Kansas	W	W	209	931	--	--	13,400	61,500	20,600	98,500
Kentucky	W	W	1,540	7,310	W	W	18,000	87,100	56,100	257,000
Maine	W	W	--	--	W	W	1,530	8,630	1,530	9,450
Maryland	2,030	4,670	W	W	--	--	3,880	39,600	16,900	114,000
Massachusetts	W	W	W	W	W	W	1,720	19,000	1,720	19,000
Michigan	5,980	11,400	W	W	W	W	13,700	50,800	34,700	112,000
Minnesota	--	--	167	607	--	--	4,610	19,600	8,400	34,900
Mississippi	747	W	29	215	--	--	W	W	1,870	7,290
Missouri	6,880	21,000	2,130	19,700	363	1,820	27,500	132,000	67,300	317,000
Montana	869	3,250	W	W	W	W	541	2,740	1,410	6,010
Nebraska	W	W	286	2,400	--	--	4,340	23,600	6,890	41,600
Nevada	--	--	81	1,420	W	W	1,560	13,100	1,640	14,600
New Hampshire	--	--	--	--	--	--	W	W	W	W
New Jersey	--	--	W	W	--	--	W	W	W	W
New Mexico	W	W	--	--	--	--	1,240	6,700	1,880	8,660
New York	4,150	16,200	99	912	--	--	3,500	21,600	35,000	198,000
North Carolina	--	--	10	53	--	--	W	W	4,540	31,600
Ohio	1,700	7,020	W	W	W	W	22,200	111,000	56,100	250,000
Oklahoma	W	W	W	W	--	--	6,240	23,200	24,400	98,800
Oregon	W	W	--	--	--	--	W	W	W	W
Pennsylvania	4,920	26,800	819	9,350	583	4,140	12,400	75,900	58,600	346,000
Rhode Island	--	--	9	W	--	--	W	W	W	W
South Carolina	--	--	--	--	--	--	1,610	8,710	1,610	8,710
South Dakota	W	W	--	--	W	W	W	W	2,850	9,520
Tennessee	W	W	708	5,690	W	W	7,060	47,400	48,400	261,000
Texas	9,610	23,900	483	3,050	2,780	11,600	7,080	48,600	72,300	286,000
Utah	W	W	W	W	W	W	4,350	18,600	4,350	18,600
Vermont	--	--	--	--	--	--	1,800	11,200	2,030	12,400
Virginia	1,480	4,920	978	12,600	1,550	6,350	4,470	30,700	19,900	118,000
Washington	--	--	W	W	W	W	2,420	24,700	2,430	24,700
West Virginia	W	W	W	W	W	W	5,620	39,900	13,800	85,200
Wisconsin	--	--	414	3,180	W	W	11,700	47,700	23,700	96,400
Wyoming	--	--	39	275	--	--	1,480	5,840	1,520	6,120
Total	61,000	205,000	14,100	106,000	6,680	31,200	295,000	1,650,000	878,000	4,410,000
Total withheld	20,400	72,800	2,170	15,700	11,600	62,200	9,990	66,300	2,030	14,900
Grand total	81,400	278,000	16,300	122,000	18,300	93,400	XX	XX	881,000	4,420,000

W Withheld to avoid disclosing company proprietary data; included with "Total withheld" and "Other uses." XX Not applicable.

1/ Includes a minor amount of limestone-dolomite reported without a distinction between the two.

2/ Data rounded by the U. S. Bureau of Mines to three significant digits; may not add to totals shown.

TABLE 16
CRUSHED MARBLE SOLD OR USED BY PRODUCERS IN
THE UNITED STATES IN 1994, BY USE 1/

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Coarse aggregate (+1 1/2 inch):		
Riprap and jetty stone	23	250
Filter stone	(2/)	3
Coarse aggregate, graded:		
Bituminous aggregate, coarse	136	938
Other graded coarse aggregate	9	155
Coarse and fine aggregates:		
Unpaved road surfacing	2	13
Terrazzo and exposed aggregate	88	2,690
Roofing granules	1	25
Other construction materials 3/	888	6,060
Chemical and metallurgical:		
Lime manufacture	50	1,100
Other specified uses not listed 4/	1,550	33,300
Unspecified: 5/		
Actual	1,000	7,300
Estimated	2,340	13,300
Total	6,090	65,100

1/ Data rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Less than 1/2 unit.

3/ Includes concrete aggregate (coarse), bituminous surface treatment aggregate, screening-undesignated, graded roadbase or subbase, and crusher run (select material or fill).

4/ Includes mine dusting or acid water, other agricultural uses, other fillers or extenders, and whiting or whiting substitute.

5/ Includes production reported without a breakdown by end use and estimates for respondents.

TABLE 17
CRUSHED GRANITE AND TRAPROCK SOLD OR USED BY PRODUCERS
IN THE UNITED STATES IN 1994, BY USE 1/

(Thousand metric tons and thousand dollars)

Use	Granite		Traprock	
	Quantity	Value	Quantity	Value
Coarse aggregate (+1 1/2 inch):				
Macadam	1,540	8,380	187	1,470
Riprap and jetty stone	3,350	25,700	1,370	10,300
Filter stone	1,080	7,220	649	3,980
Other coarse aggregate	1,350	7,970	1,480	9,380
Coarse aggregate, graded:				
Concrete aggregate, coarse	15,800	107,000	7,150	52,200
Bituminous aggregate, coarse	16,600	113,000	4,860	36,300
Bituminous surface-treatment aggregate	2,150	19,100	2,210	14,200
Railroad ballast	7,670	46,600	1,860	11,100
Other graded coarse aggregate	4,190	29,300	2,210	18,600
Fine aggregate (-3/8 inch):				
Stone sand, concrete	2,880	19,800	1,520	15,100
Stone sand, bituminous mix or seal	3,750	21,700	1,570	12,800
Screening, undesignated	4,850	23,700	2,710	15,300
Other fine aggregate	1,100	7,320	452	3,210
Coarse and fine aggregates:				
Graded road base or subbase	20,300	107,000	15,500	79,600
Unpaved road surfacing	1,460	4,890	3,340	13,800
Terrazzo and exposed aggregate	302	2,230	(2/)	(2/)
Crusher run or fill or waste	11,100	52,600	2,810	16,600
Other coarse and fine aggregates	2,670	20,600	4,880	37,000
Roofing granules	2,350	25,700	(2/)	(2/)
Other construction materials	2,280	16,600	3,030 3/	25,800 3/
Agricultural:				
Poultry grit and mineral food	(4/)	(4/)	--	--
Other agricultural uses	293	650	--	--
Special:				
Asphalt fillers or extenders	(5/)	(5/)	--	--
Other fillers or extenders	--	--	(5/)	(5/)
Other uses not listed	18	295	99	854
Unspecified: 6/				
Actual	61,600	394,000	16,300	94,100
Estimated	9,380	58,900	16,700	104,000
Total	178,000	1,120,000	91,000	576,000

1/ Data rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Included with "Other construction materials."

3/ Includes pipe bedding.

4/ Included with "Other agricultural uses."

5/ Included with "Other uses not listed."

6/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 18
CRUSHED SANDSTONE AND QUARTZITE SOLD OR USED BY PRODUCERS IN THE
UNITED STATES IN 1994, BY USE 1/

(Thousand metric tons and thousand dollars)

Use	Sandstone		Quartzite	
	Quantity	Value	Quantity	Value
Coarse aggregate (+1 1/2 inch):				
Macadam	W	W	--	--
Riprap and jetty stone	558	3,240	196	1,040
Filter stone	253	1,440	34	190
Other coarse aggregate	34	235	112	629
Coarse aggregate, graded:				
Concrete aggregate, coarse	1,620	9,260	330	2,000
Bituminous aggregate, coarse	1,460	9,790	271	1,360
Bituminous surface-treatment aggregate	700	5,310	79	480
Railroad ballast	93	519	323	1,740
Other graded coarse aggregate	202	1,310	173	900
Fine aggregate (-3/8 inch):				
Stone sand, concrete	755	5,120	153	605
Stone sand, bituminous mix or seal	513	2,980	116	630
Screening, undesignated	966	5,360	78	375
Other fine aggregate	W	W	--	--
Coarse and fine aggregates:				
Graded road base or subbase	3,880	17,600	509	2,630
Unpaved road surfaces	417	3,220	205	905
Terrazzo and exposed aggregate	72	862	8	129
Crusher run or fill or waste	1,000	4,630	68	393
Other coarse and fine aggregates	600	3240	204 2/	904
Other construction materials	91	434	--	--
Agricultural:				
Other agricultural uses	--	--	1	6
Chemical and metallurgical:				
Cement manufacture	821	4,480	171	1,220
Flux stone	--	--	632	6,060
Glass manufacture	--	--	(3/)	(3/)
Special:				
Mine dusting or acid water treatment	(3/)	(3/)	--	--
Asphalt fillers or extenders	(3/)	(3/)	--	--
Other uses not listed 4/	124	822	54	696
Unspecified: 5/				
Actual	8,730	56,700	2,880	16,600
Estimated	4,550	34,100	231	1,570
Total	27,400	171,000	6,830	41,100

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Data rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Includes pipe bedding.

3/ Included with "Other uses not listed."

4/ Includes poultry grit and mineral food.

5/ Includes production reported without breakdown by end use and estimates for nonrespondents.

TABLE 19
CRUSHED VOLCANIC CINDER AND SCORIA AND CRUSHED MISCELLANEOUS STONE 1/
SOLD OR USED BY PRODUCERS IN THE UNITED STATES IN 1994, BY USE 2/

(Thousand metric tons and thousand dollars)

Use	Volcanic cinder and scoria		Miscellaneous stone	
	Quantity	Value	Quantity	Value
Coarse aggregate (+1 1/2 inch):				
Riprap and jetty stone	9	40	135	509
Filter stone	101	454	48	246
Other coarse aggregate	46	252	199	1,310
Course aggregate, graded:				
Concrete aggregate, coarse	119	493	457	1,900
Bituminous aggregate, coarse	6	35	572	2,750
Bituminous surface-treatment aggregate	--	--	8	39
Railroad ballast	--	--	W	W
Other graded coarse aggregate	--	--	238	1,400
Fine aggregate (-3/8 inch):				
Stone sand, concrete	13	171	W	W
Stone sand, bituminous mix or seal	--	--	61	304
Screening, undesignated	1	9	304	797
Coarse and fine aggregates:				
Graded road base or subbase	362	1,680	6,480	28,700
Unpaved road surfacing	87	207	931	4,380
Terrazzo and exposed aggregate	266	2,650	140	1,360
Crusher run or fill or waste	83	327	381	689
Other coarse and fine aggregates	--	--	379	1,790
Roofing granules	W	W	492	6,420
Other construction materials	73	453	1,900	10,300
Agricultural:				
Poultry grit and mineral food	--	--	(3/)	(3/)
Other agricultural uses	38	333	41	244
Chemical and metallurgical:				
Cement manufacture	--	--	2,840	17,200
Other specified uses not listed	61	602	42 4/	764
Unspecified: 5/				
Actual	750	4,640	10,200	53,000
Estimated	44	261	10,400	68,600
Total	2,060	12,600	36,300	211,000

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials" and/or "Total."

1/ Includes marl, shell, slate, and other stone.

2/ Data rounded by U.S. Bureau of Mines to three significant digits; may not add to totals shown.

3/ Included with "Other specified uses not listed."

4/ Includes flour (slate).

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 20
CRUSHED STONE SOLD OR USED BY PRODUCERS IN THE UNITED STATES IN 1994,
BY REGION AND METHOD OF TRANSPORTATION 1/

(Thousand metric tons)

Region	Truck	Rail	Water	Other	Not transported	Not specified	Total
Northeast:							
New England	9,450	491	(2/)	(2/)	2,220	13,900	26,100
Middle Atlantic	80,300	1,700	3,810	719	15,200	34,200	136,000
Midwest:							
East North Central	99,200	6,180	26,500	715	13,300	83,800	230,000
West North Central	59,500	2,130	7,490	7	11,000	70,200	150,000
South:							
South Atlantic	138,000	14,200	4,240	153	21,100	115,000	293,000
East South Central	78,400	3,530	12,500	1,960	9,170	34,200	140,000
West South Central	67,400	21,000	2,400	4,190	11,300	24,000	130,000
West:							
Mountain	14,400	4,190	(2/)	1,490	2,350	13,400	35,800
Pacific	34,900	1,470	377	10,500	5,300	35,100	87,600
Total	582,000	54,900	57,300	19,700	91,000	424,000	1,230,000

1/ Data rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Less than 1/2 unit.

TABLE 21
NUMBER OF CRUSHED AND BROKEN STONE OPERATIONS AND PROCESSING
PLANTS IN THE UNITED STATES IN 1994, BY STATE 1/

State	Mining operations on land					Total active operations
	Stationary	Portable	Stationary and portable	No. plants or unspecified	Dredging operations	
Alabama	37	3	--	1	--	41
Alaska 2/	3	11	1	7	--	21
Arizona	16	7	2	7	1	33
Arkansas	26	8	2	5	--	41
California	59	29	9	31	1	129
Colorado	6	6	6	7	--	25
Connecticut	15	2	--	--	--	17
Florida	35	28	7	11	5	86
Georgia	66	2	--	3	--	71
Hawaii	19	8	3	6	--	36
Idaho	6	35	5	3	--	49
Illinois	86	53	10	5	--	154
Indiana	71	4	4	1	--	80
Iowa	23	198	--	6	2	229
Kansas	18	87	2	4	--	111
Kentucky	79	5	2	6	--	92
Louisiana	1	--	--	4	3	8
Maine	6	6	1	2	--	15
Maryland	22	7	2	2	--	33
Massachusetts	23	5	3	4	--	35
Michigan	18	12	1	4	2	37
Minnesota	10	33	1	12	--	56
Mississippi	4	1	--	--	--	5
Missouri	94	95	8	12	--	209
Montana	11	4	--	1	--	16
Nebraska	6	4	2	--	--	12
Nevada	10	6	2	--	--	17
New Hampshire	7	2	1	2	--	12
New Jersey	12	1	8	--	--	21
New Mexico	21	21	2	4	--	48
New York	64	12	15	11	--	102
North Carolina	85	7	4	3	--	99
Ohio	82	17	6	2	1	108
Oklahoma	42	6	7	2	--	57
Oregon	33	89	7	20	1	150
Pennsylvania	130	24	20	23	--	197
Rhode Island	7	--	--	--	--	7
South Carolina	28	1	1	1	--	31
South Dakota	10	--	1	--	--	11
Tennessee	104	6	4	2	--	116
Texas	62	47	13	5	1	128
Utah	9	11	1	--	--	21
Vermont	7	6	2	4	--	19
Virginia	91	5	5	--	--	100
Washington	30	60	5	27	--	121
West Virginia	28	10	2	2	--	42
Wisconsin	25	134	--	19	--	176
Wyoming	8	6	--	--	--	14
Total	1,660	1,120	177	271	17	3,240

1/ Data rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Data derived in part from the Alaska Geological Survey.

TABLE 22
U.S. EXPORTS OF CRUSHED STONE IN 1994, BY DESTINATION 1/

(Metric tons)

Destination	Limestone for cement manufacturing	Other	Chalk, crude	Granules, chippings	Total
North America:					
Aruba	--	--	--	2	2
Bahamas, The	198	--	--	--	198
Barbados	--	--	27	--	27
Bermuda	37	--	--	--	37
British Virgin Islands	9	--	--	--	9
Canada	4,380,000	277	1,970	168,000	4,550,000
Cayman Islands	--	--	--	323	323
Jamaica	7,680	--	--	16	7,700
Mexico	2,300	235	462	5,340	8,340
Netherlands Antilles	--	--	--	1	1
Panama	--	--	54	461	515
Trinidad and Tobago	--	--	18	--	18
Total	4,390,000	512	2,530	174,000	4,570,000
South America:					
Argentina	20	--	1	61	82
Brazil	6,650	63	--	--	6,710
Colombia	--	5	--	20	25
Ecuador	--	--	92	2	94
Guyana	--	--	2	--	2
Venezuela	920	18	37	36	1,010
Total	7,590	86	132	119	7,930
Europe:					
Austria	4,700	--	--	--	4,700
Belgium	50,700	--	--	--	50,700
Denmark	180	--	--	--	180
Finland	--	--	--	21	21
France	11,700	71	12	61	11,900
Germany	161,000	2,230	--	276	163,000
Greece	--	--	--	32	32
Hungary	1,680	--	--	--	1,680
Ireland	416	374	--	--	790
Italy	96,700	47	--	45	96,800
Netherlands	900	221	6	34	1,160
Norway	--	--	4	--	4
Poland	--	146	--	--	146
Russia	--	--	--	22	22
Spain	--	12	--	--	12
Sweden	8,100	1	--	--	8,100
Switzerland	2,100	23	--	121	2,240
United Kingdom	75,800	55	30	121	76,000
Total	414,000	3,180	51	733	418,000
Asia:					
China	35,600	14	132	--	35,700
Hong Kong	132	40	1	19	192
Indonesia	20,900	11	--	--	20,900
Japan	79,000	90	2	519	79,600
Korea, Republic of	5,400	25	--	757	6,180
Malaysia	160	49	--	33	242
Philippines	73	--	12	--	85
Singapore	--	28	--	57	85
Sri Lanka (Ceylon)	18	--	--	34	52
Taiwan	31,800	19	--	108	31,900
Thailand	820	--	16	--	836
Total	174,000	276	163	1,530	176,000

See footnotes at end of table.

TABLE 22 - CONTINUED
U.S. EXPORTS OF CRUSHED STONE IN 1994, BY DESTINATION

(Metric tons)

Destination	Limestone for cement manufacturing	Other	Chalk, crude	Granules, chippings	Total
Oceania:					
Australia	4,790	1	131	79	5,000
Total	4,790	1	131	79	5,000
Middle East:					
Israel	--	604	95	--	699
Saudi Arabia	68	--	--	139	207
United Arab Emirates	--	--	--	11	11
Total	68	604	95	150	917
Africa:					
Egypt	--	--	10	611	621
Total	--	--	10	611	621
Grand total	4,990,000	4,660	3,110	177,000	5,180,000
Total value (thousands)	\$25,300	\$3,820	\$1	\$9,010	\$38,100

1/ Data rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

Source: U.S. Bureau of the Census.

TABLE 23
U.S. IMPORTS OF CRUSHED STONE AND CALCIUM CARBONATE FINES, BY TYPE 1/

(Thousand metric tons and thousand dollars)

Type	1993		1994		Unit price
	Quantity	C.i.f. value 2/	Quantity	C.i.f. value 2/	
Crushed stone and chips:					
Limestone 2/	4,980	41,100	5,100	41,500	\$8
Limestone for flux or cement manufacturing	3,070	21,400	3,250	23,800	\$7
Quartzite	(2/)	343	(2/)	156	\$591
Other	353	6,230	583	9,030	\$15
Total	8,400	69,000	8,930	74,500	XX
Calcium carbonate fines: 3/					
Natural chalk	(4/)	255	(4/)	1,940	\$8,160
Calcium carbonates other chalk	44	5,060	5	1,440	\$300
Total	44	5,310	5	3,380	XX
Grand total	8,440	74,300	8,930	77,800	XX

XX Not applicable.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Excludes limestone for cement manufacturing.

3/ Excludes precipitated calcium carbonates.

4/ Less than 1/2 unit.

Source: U.S. Bureau of the Census.



CRUSHED STONE

Statistical Compendium

Stone, in its multitude of forms, represents a very significant part of the Earth's crust and one of the most accessible natural resources. Stone has been used since the earliest days of our civilization, first as a tool or weapon, then as construction material, and later, in its crushed form, as one of the basic raw materials for a wide variety of uses ranging from agriculture and chemicals to complex industrial processes. At the beginning of the 20th century, the U.S. production of crushed stone was relatively small, and its uses limited. Today, crushed stone is being produced in 48 of the 50 States, and its annual production tonnage ranks first in the nonfuel minerals industry. The United States is, in general, self-sufficient in crushed stone, producing enough to meet most of the domestic needs. Small quantities of crushed stone, used mainly as construction aggregates, are being imported mostly by water from the Bahamas, Canada, and Mexico to compensate for local shortages that exist in some areas of the country.

The demand for crushed stone is determined mostly by the level of construction activity, and, therefore, the demand for construction materials. U.S. production of crushed stone recorded a significant growth in the past 40 years, from 229 million metric tons in 1950 to 1.1 billion metric tons in 1990. The highest level of production was reached in 1988--1.13 billion metric tons. Between 1950 and 1973, because of the construction of the Interstate Highway System, the growth from year to year in the production of crushed stone was almost continuous, paralleling the increased demand for construction aggregates. Following the reduction in the volume of work in the Interstate Highway Program in the late 1960's, the crushed stone industry, while still growing, became more sensitive to the ups and downs of the economy. The 1974-75 and 1982 recessions are well reflected by low levels of production of crushed stone in those years. Future demand for crushed stone will continue to be dependent mostly on the growth of construction activity.

Most crushed stone is used for construction purposes, mainly as aggregate with or without a binder. Road base or road surfacing material, macadam, riprap, and railroad ballast are the major uses without a binder. Aggregate for cement and bituminous concrete in highway and road construction and repair and in residential and nonresidential construction are the major uses for aggregates with a binder. Other uses include cement and lime manufacture, agriculture, metallurgical flux, and fillers and extenders.

Crushed stone is a high-volume, low-value commodity. The industry is highly competitive and is characterized by thousands of operations serving local or regional markets. Production costs are determined mainly by the cost of labor, equipment, energy, and water, in addition to the costs of compliance with environmental and safety regulations. These costs vary depending on geographic location, the nature of the deposit, and the number and type of products produced. Despite having one of the lowest average-per-ton values of all mineral commodities, the constant dollar price of crushed stone has changed relatively little during the past 20 years. As a result of rising costs of labor, energy, and mining and processing equipment, the average unit price of crushed stone increased from \$1.58 per metric ton, f.o.b. plant, in 1970 to \$4.39 in 1990. However, the unit price in constant 1982 dollars fluctuated between \$3.48 and \$3.91 per metric ton for the same period. Increased productivity achieved through increased use of automation and more efficient equipment was mainly responsible for maintaining the prices at this level.

Underground operations are becoming more common, especially for limestone mining in the central and eastern parts of the United States, as the advantages of such operations are increasingly recognized by the producers. By operating underground, a variety of problems usually connected with surface mining such as environmental impacts and community acceptance are significantly reduced.

Transportation is a major factor in the delivered price of crushed stone. The cost of moving crushed stone from the plant to the market often equals or exceeds the sale price of the product at the plant. Because of the high cost of transportation and the large quantities of bulk material that have to be shipped, crushed stone is usually marketed

locally. The high cost of transportation is responsible for the wide dispersion of quarries around the country, usually located near highly populated areas. However, increasing land values combined with local environmental concerns are moving crushed stone quarries farther from the end-use locations, increasing the price of delivered material. Economies of scale, which might be realized if fewer, larger operations served larger marketing areas, would probably not offset the increased transportation costs.

Although crushed stone resources are widespread and in adequate supply nationally, local shortages exist. Land use conflicts and environmental problems associated with rapid urban expansion are major factors contributing to these shortages. The local shortages that occasionally exist are caused less by a lack of stone than by urban encroachment or zoning regulations that force closure of operating quarries or prevent the development of new ones. Demand pressures, land use regulations, and the cost of meeting environmental and reclamation requirements are factors that will cause a rising price trend.

Sand and gravel and to a lesser extent iron-blast-furnace slag are the predominant substitutes for crushed stone used as construction aggregate. Steel slag is another substitute for crushed stone in road bases and asphaltic concrete, but not in cement concretes because of chemical interaction. Blast-furnace slag is also used as a stone substitute in cement manufacturing.

Stone remains an abundant material, and, despite environmental, zoning, and regulatory restrictions, no shortages on a large scale are expected to occur in the future.

- [Table 1.--U.S. historical salient crushed stone statistics in the United States \(TXT\)](#)
- [Table 2.--Crushed stone sold or used in the United States, by kind \(TXT\)](#)
- [Table 3.--Crushed stone sold or used in the United States, by region \(TXT\)](#)
- [Table 4.--Crushed stone sold or used by producers in the United States, by State \(TXT\)](#)
- [Table 5.--Crushed stone sold or used by producers in the United States, by use, 1971-83 \(TXT\)](#)
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- [Table 7.--Crushed stone sold or used by producers in the United States, by method of transportation \(TXT\)](#)
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- [Table 9.--U.S. crushed stone sold or used by producers, by size of operation, 1977-80 \(TXT\)](#)
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- [Table 11.--U.S. crushed stone sold or used by producers, by size of operation, 1989 \(TXT\)](#)
- [Table 12.--Exports of crushed stone, by destination and type \(TXT\)](#)
- [Table 13.--Exports of crushed stone, by destination and type \(TXT\)](#)
- [Table 14.--U.S. imports for consumption of stone, by type \(TXT\)](#)

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(PM)

STONE, CRUSHED

By Valentin V. Tepordei

Domestic survey data and tables were prepared by Susan M. Copeland, statistical assistant.

Crushed stone, one of the most accessible natural resources, is a major basic raw material used by construction, agriculture, and other industries which utilize complex chemical and metallurgical processes. Despite the low value of its basic products, the crushed stone industry is a major contributor to and an indicator of the economic well-being of the Nation.

A total of 1.51 billion metric tons of crushed stone was produced for consumption in the United States in 1998, a 100-million-ton increase, or 6.8%, compared with the revised total production of 1997. This tonnage represents the highest production level ever recorded in the United States, indicating a continued increase in the demand for construction aggregates (table 1).

About 70% of the crushed stone production continued to be limestone and dolomite, followed, in descending order of tonnage, by granite, traprock, sandstone and quartzite, miscellaneous stone, marble, slate, calcareous marl, volcanic cinder and scoria, and shell (table 2).

Foreign trade of crushed stone continued to remain small. Exports increased by 6.8% to 4.4 million tons, and the value decreased by 2.8% to \$41.5 million compared with that of 1997.

Imports of crushed stone, including calcium carbonate, increased by 9.7% to 13.6 million tons, and the value increased by 9.4% to \$116 million (table 22-23). Domestic apparent consumption of crushed stone, which is defined as production for consumption (sold or used) plus imports minus exports, was 1.52 billion tons (tables 1, 25, and 26).

Legislation

The Transportation Equity Act for the 21st Century (Public Law 105-178), passed in 1998, appropriated \$205 billion through 2003 for transportation. The law guarantees that \$165 billion will be obligated for highways and \$35 billion for transit work projects and represents a 44% increase compared with the previously enacted Intermodal Surface Transportation Efficiency Act legislation. The guaranteed amounts are linked to actual Highway Trust Fund receipts and can be used only for highways and highway safety programs. The States are also guaranteed a return of at least 90.5% of their contributions to the Highway Trust Fund. The law introduced a number of procedural reforms that should reduce delays in road-building project approval. These reforms include streamlining the environmental review process, the elimination of programmatic responsibilities of regional Departments of Transportation, and an improved project approval process that gives States more responsibility on non-Interstate projects. The legislation also established timetables for determining if States are complying

with the U.S. Environmental Protection Agency's new air-quality standards for particulate matter, also known as PM 2.5, and ozone.

During 1988, the aggregates industry continued to work with the Mines Safety and Health Administration (MSHA) on a series of issues of concern to the industry. One of these issues was the new rules on training requirements for miners at sand and gravel, surface stone quarries, and other mines. The U.S. Congress directed MSHA to complete the new training rules by September 30, 1999 (Rock Products, 1999a). Another issue was new requirements for mine operators to limit miners' exposure to noise. MSHA indicated that the rule is likely to set a noise-exposure level at which the employers will be required to take steps to limit miners' exposure. The agency was also considering provisions addressing the role of engineering controls versus administrative controls, the use of personal hearing protection devices, and criteria for audiometric testing and exposure monitoring (Rock Products, 1999a). A National Institute for Occupational Safety and Health study concluded that hearing loss in male miners in the metal/nonmetal sectors was significantly greater than the average population. The study has become part of the record established by MSHA and will be used to support the agency's efforts to establish new noise-exposure limits in mines (Rock Products 1999b).

Production

Domestic production data for crushed stone are derived by the U.S. Geological Survey (USGS) from voluntary surveys of U.S. producers. Of the 4,705 crushed stone operations on the mailing list and 270 operations added to the survey, 3,420 operations with 3,823 quarries owned by 1,526 companies were active. Of the 3,420 active operations, 2,571 operations with 2,935 quarries, representing 75.2% of the total number of active operations, reported to the USGS. Their total production represented 86.4% of the total U.S. crushed stone output. Of the 2,571 reporting operations, 760 operations with 848 quarries owned by 153 companies did not report a breakdown by end use. Their production represented 28.8% of the U.S. total and is included in table 13 under "Unspecified, actual" uses. The nonrespondents' production was estimated by using employment data and/or adjusted production reports from prior years. The estimated production from 849 nonresponding operations owned by 652 companies represented 13.6% of the U.S. total and is included in table 13 under "Unspecified, estimated" uses.

A total of 97 underground mines that are included in the total number of active operations produced 53.3 million tons of crushed stone in 1998. Underground mines were located in 20

States. The leading States were, in descending order of tonnage, Kentucky, Iowa, Pennsylvania, Missouri, and Tennessee. Their production represented 74.3% of the total U.S. crushed stone produced from underground mines.

A total of 888 quarries were either idle or presumed to have been idle in 1998 because no information was available to estimate their production. Since the 1997 survey, 105 operations were closed down. Most of the idle or closed operations were small, temporary quarries, some of them operated by State or local governments. Operations located in the U.S. territories are not included in the above count.

A total of 1.51 billion tons of crushed stone was produced for consumption in the United States in 1998, a 6.8% increase compared with the 1997 total (table 1). Of this total, 1.06 billion tons, or 70.4%, was limestone and dolomite, 240 million tons, or 15.9%, was granite, and 108 million tons, or 7.2%, was traprock. The remaining 99 million tons, or 6.5%, was shared, in descending order of quantity, by sandstone and quartzite, miscellaneous stone, marble, slate, calcareous marl, volcanic cinder and scoria, and shell (table 2).

A comparison of the four geographic regions of the United States indicates that, in 1998, the South continued to lead the Nation in the production of crushed stone with 707 million tons, or 46.8%, of the total, followed by the Midwest with 443 million tons, or 29.3%, and the Northeast with 201.6 million tons, or 13.4%. About 76% of the total U.S. crushed stone output was produced in the South and the Midwest (table 3).

Of the nine geographic divisions, as shown in figure 1, the South Atlantic led the Nation in the production of crushed stone with 360 million tons, or 23.8%, of the U.S. total. It was followed by the East North Central division with 284 million tons, or 18.8%, and the West South Central with 174 million tons, or 11.5%.

A comparison of the production data by the nine geographic divisions for 1997 and 1998 indicates that the output of crushed stone increased in all regions. The largest percentage increases were recorded in the West South Central division, 18.4%; the New England division, 13.3%; and the Pacific division, 11.1%.

Crushed stone was produced in every State except Delaware. The 10 leading producing States, in descending order of tonnage, were, Texas, Pennsylvania, Florida, Ohio, Georgia, Illinois, North Carolina, Missouri, Virginia, and Tennessee. Their combined production represented 50.6% of the national total.

Crushed stone was produced by 1,526 companies at 3,420 operations with 3,823 quarries. Leading U.S. producing companies in descending order of tonnage, were, Vulcan Materials Co., Martin Marietta Aggregates, Hanson Building Materials America/Hanson Aggregates, Oldcastle, Inc./Materials Group, and Lafarge Corp.

A review of production by size of operation at the national level indicates that in 1998, 53.6% of crushed stone was produced by 462 operations reporting more than 1 million metric tons per year, 24.1% was produced by 554 operations reporting between 500,000 and 999,999 tons per year, and 22.3% was produced by operations reporting less than 500,000 tons per year (table 7).

In 1998, consolidation in the aggregates industry continued

at a somewhat accelerated pace. The majority of the acquisitions were made by the major producers of aggregates, most of which were publicly owned. These companies tried to expand their base of operations in new areas of the country or acquired operations or companies with significant amounts of reserves. Stricter environmental and permitting regulations make it more difficult to start a new operation than to acquire an existing one. Some of the acquired companies continue to operate as semi-independent organizations, but with the benefit of financial and management support provided by the larger new owner.

In January, Cornerstone Construction & Materials Inc., which became Hanson Building Materials America/Hanson Aggregates of Research Triangle Park, NC, later in the year, traded its Verdon Quarry located in Doswell, VA, and Lee Hall Sales Yard in Newport News, VA, for the Harding Street Quarry located in Indianapolis, IN, owned by Martin Marietta Aggregates of Raleigh, NC. The transaction satisfied the condition of the consent order with the U.S. Department of Justice, entered into at the time Martin Marietta acquired American Aggregates Corp. (Pit & Quarry, 1998a).

Several acquisitions were announced in March. Lafarge Corp. of Reston, VA, announced the purchase of a number of the North America aggregates operations owned by Redland Aggregates North America of Denver, CO, that included Denver-based Western Mobile, Inc., Redland Genstar Inc. of Towson, MD., Redland Stone Products Co. of San Antonio, TX, as well as Redland Quarries, Inc. of Hamilton, Ontario, Canada (Aggregates Manager, 1998c).

Martin Marietta Aggregates acquired a granite quarry from FMC Corp. of Chicago, IL, located in Bessemer City, NC, that owns significant reserves (Rock Products, 1998a). U.S. Aggregates Inc. of San Mateo, CA, announced that it had acquired Falcon Ridge Construction Inc. and its Rolfe Quarry, which produces crushed limestone for hot-mixed asphalt and ready-mixed concrete for the Salt Lake City, UT market (Rock Products, 1998a).

In April, Martin Marietta Aggregates broadened its geographic market by purchasing Mid-State Construction & Materials of Little Rock, AK, which operates quarries near Hot Springs and Little Rock, AK, and owns significant reserves in that area (Rock Products, 1998b). MDU Resources Group of Bismarck, ND, announced that it had acquired through merger ownership of Angel Brothers of Portland, OR, a crushed stone producer with about 80 million tons of permitted reserves in the Portland area. The newly acquired quarry will operate as part of Morse Brothers, Inc. now a subsidiary of MDU's Knife River Corp. (Rock Products, 1998b).

In May, Vulcan Materials of Birmingham, AL, announced the purchase of two quarries from C.W. Matthews Quarries of Marietta, GA, that will be part of Vulcan's Southeast Division. This acquisition brings the number of quarries operated by Vulcan Materials in Georgia to 18. At about the same time, Vulcan Materials bought two quarries in southern Illinois from Columbia Quarry Co. of Columbia, IL, and placed them under the management of its Reed Crushed Stone Co. operation near Paducah, KY (Rock Products, 1998c).

In August, Martin Marietta Aggregates announced the

acquisition of a granite quarry located near Lenoir, NC, from Caldwell Stone Co., and of a limestone quarry near Barnhart, MO, south of St. Louis, from Greismer Underground. Both acquisitions own significant reserves (Aggregates Manager, 1998b). Hunt Midwest Mining Inc. of Kansas City, MO, purchased the assets of Trager Stone Inc. and Trager Ready Mix Inc. of Chillicothe, MO. Trager Stone operates quarries in Mooresville, Edinburg, Pattonsburg, and Braymer, MO (Pit & Quarry, 1998b).

In September, Martin Marietta Aggregates expanded its presence in two markets by purchasing an underground limestone mine in Preston County, WV, from Greenbrier Aggregates, and a limestone quarry in Ottawa, KS, from Fogle Quarry Co. of Ottawa, KS (Rock Products, 1998d). Global Stone Corp. of Roswell, GA, completed the acquisition of a white marble mine, a limestone mine, and two automated processing plants located in Chatsworth, GA, from Filler Products Inc. (Aggregates Manager, 1998c).

In October, Martin Marietta Aggregates announced the acquisition of Redland Stone Products of San Antonio, TX, from Lafarge (Pit & Quarry, 1998c).

In December, Vulcan Materials acquired Burns Stone Co., which owned a limestone quarry in Dickinson, TN (Aggregates Manager, 1998d).

Limestone.—The 1998 output of crushed limestone, including some dolomite, increased by 5% to 955 million tons valued at \$4.8 billion compared with the revised 1997 totals (table 2).

Limestone only was produced by 869 companies at 1,978 operations with 2,115 quarries in 48 States. In addition, 38 companies with 54 operations and 57 quarries reported producing limestone and dolomite from the same quarries. Their combined production, 27.6 million tons, is included with the limestone shown in table 2. The limestone totals shown in this chapter, therefore, include an undetermined amount of dolomite in addition to the dolomite reported separately.

The leading producing States were, in descending order of tonnage, Texas, Florida, Missouri, Ohio, and Kentucky; these five States accounted for 37% of the total U.S. output (table 8). The leading producers were, in descending order of tonnage, Vulcan Materials, Martin Marietta Aggregates, Hanson Building Materials America/Hanson Aggregates, Rogers Group, Inc., and Lafarge.

Dolomite.—Production of dolomite increased by 7.9% to 109 million tons valued at \$537 million compared with the revised 1997 totals (table 2). Crushed dolomite was reportedly produced by 105 companies at 176 operations with 186 quarries in 28 States. An additional undetermined amount of dolomite is included in the total crushed limestone, as explained above.

The leading producing States were, in descending order of tonnage, Pennsylvania, Illinois, Ohio, Indiana, and Michigan; these five States accounted for 61.9% of the total U.S. output (table 8). The leading producers were Oldcastle, S.E. Johnson Co., Hanson Building Materials America/Hanson Aggregates, Material Services Corp., and Vulcan Materials.

Marble.—Production of crushed marble increased by 15.5% to 8.6 million tons valued at \$115 million compared with that of 1997 (table 2). Crushed marble was produced by 19

companies with 29 operations and 62 quarries in 13 States (table 9). The leading producers of crushed marble were, in descending order of tonnage, Dry Branch Kaolin Co., Pluess Stauffer, Inc., Aggregate Industries Management, Inc., Vulcan Materials, and Florida Rock Industries, Inc.

Calcareous Marl.—Output of marl decreased by 1.3% to 4.7 million tons valued at \$19 million compared with the revised 1997 totals (table 2). Marl was produced by 9 companies with 9 operations and 13 quarries in 6 States (table 9). The leading producers were, in descending order of tonnage, Holderbank/Holman, Inc., Capitol Aggregates Inc., and Giant Group Ltd.

Shell.—Shell is derived mainly from fossil reefs or oyster shell. The output of crushed shell increased by 51.7% to 2.2 million tons valued at \$9.3 million compared with the revised 1997 totals (table 2). Crushed shell was produced by 9 companies with 10 operations in 6 States. The leading producers were, in descending order of tonnage, Caloosa Shell Corp., Schroe Mante Ranch, and F&M Mines, Inc.

Granite.—The output of crushed granite increased by 14.8% to 240 million tons valued at \$1.5 billion compared with the revised 1997 totals (table 2). Crushed granite was produced by 150 companies at 343 operations with 377 quarries in 35 States.

The leading States were, in descending order of tonnage, Georgia, North Carolina, Virginia, South Carolina, and Arkansas; these five States accounted for 70.9% of the U.S. output (table 10). The leading producers were, in descending order of tonnage, Vulcan Materials, Martin Marietta Aggregates, Meridian Aggregates Co., Florida Rock Industries, Inc., and Blue Circle America, Inc.

Traprock.—Production of crushed traprock increased by 8.1% to 108 million tons valued at \$678 million, compared with the revised 1997 total (table 2). Traprock was produced by 236 companies at 362 operations with 491 quarries in 26 States.

The leading States were, in descending order of tonnage, Oregon, Washington, New Jersey, Virginia, and California; these five States accounted for 62.7% of U.S. output (table 10). Leading producers were, in descending order of tonnage, Oldcastle, Vulcan Materials, Eucon Co., Luck Stone Corp., and Stavola, Inc.

Sandstone and Quartzite.—The combined output of crushed sandstone and quartzite decreased by 3.8% to 40.7 million tons valued at \$239 million compared with the revised 1997 totals (table 2). Crushed sandstone was produced by 115 companies at 147 operations with 152 quarries in 30 States, and crushed quartzite was produced by 38 companies at 40 operations with 49 quarries in 19 States.

The leading producing States were, in descending order of tonnage of sandstone and quartzite, Arkansas, Pennsylvania, California, South Dakota, and Virginia; their combined production accounted for 56% of the U.S. output (table 10). The leading producers of sandstone were, in descending order of tonnage, Ashland Oil, Inc./APAC, Inc., Martin Marietta Aggregates, and Stabler Co.; leading producers of quartzite were Martin Marietta Aggregates, Sweetman Construction Co., and Frank W. Whitcomb Construction Corp.

Slate.—The output of crushed slate increased by 43.5% to

4.9 million tons valued at \$30.8 million, compared with the revised 1997 totals (table 2). Crushed slate was produced by 13 companies at 15 operations with 15 quarries in 10 States.

Most of the crushed slate was produced in North Carolina. The leading producers were, in descending order of tonnage, Gohmann Asphalt & Construction, Inc., Martin Marietta Aggregates, and Vulcan Materials.

Volcanic Cinder and Scoria.—Production of volcanic cinder and scoria increased 12.5% to 2.5 million tons valued at \$15.8 million compared with the revised 1997 totals (table 2).

Volcanic cinder and scoria were produced by 25 companies from 37 operations with 44 quarries in 13 States.

The leading producing States were, in descending order of tonnage, California, Arizona, and New Mexico; their combined production accounted for 46.1% of the total U.S. output (table 11). Leading producers were, in descending order of tonnage, Martin Marietta Aggregates, Stoney Point Rock Quarry, Inc., and the U.S. Forest Service.

Miscellaneous Stone.—Output of other kinds of crushed stone increased by 7% to 35.2 million tons valued at \$189 million compared with the revised 1997 totals (table 2). Miscellaneous stone was produced by 142 companies at 217 operations with 244 quarries in 28 States.

The leading producing States were, in descending order of tonnage, Pennsylvania, California, and Texas; their combined production accounted for 42% of the total U.S. output (table 11). Leading producers were, in descending order of tonnage, Better Materials Corp., L.G. Everist, Inc., the U.S. Forest Service, the U.S. Bureau of Land Management, and Haines & Kibblehouse, Inc.

Consumption and Uses

Crushed stone production reported to the USGS is actually material that was either sold or used by producers. Stockpiled production is not included in the reported quantities. The “sold or used” tonnage, therefore, represents the amount of production released for domestic consumption or export in a given year. Because some of the crushed stone producers did not report a breakdown by end use, their total production is included in “Unspecified, actual” use. The estimated production of nonrespondents is included in “Unspecified, estimated” use.

In 1998, U.S. consumption of crushed stone was 1.52 billion tons, a 6.8% increase compared with that of 1997. This total is slightly different from the “apparent consumption” of crushed stone which is defined as “U.S. production plus imports minus exports.” Of the 1.51 billion tons of crushed stone consumed, 640 million tons, or 42.4% of the total, was “Unspecified, actual and estimated” uses. Of the remaining 870 million tons reported by uses, about 82.4% was used as construction aggregates, mostly for highway and road construction and maintenance; 14.8%, for chemical and metallurgical uses, including cement and lime manufacture; 1.6%, for agricultural uses; and 0.9% for special uses and products (table 13). To provide a more accurate estimation of the consumption patterns for crushed stone, the “Unspecified” uses are not included in the above percentages. In any use pattern study or marketing

analysis, the quantities included in “Unspecified” uses should be distributed among the reported uses by applying the above percentages to the “Unspecified” uses, total.

Limestone.—Of the 955 million tons of crushed limestone consumed, 384 million tons, or 40.3%, was “Unspecified, actual and estimated” uses. Of the remaining 570 million tons of crushed limestone reported by uses, 75.6% was used as construction aggregates; 21.2%, for chemical and metallurgical applications including cement and lime manufacturing; 1.8%, for agricultural uses; and 1.0%, for special uses and products (table 14).

Dolomite.—Of the 109 million tons of crushed dolomite consumed, 50.7 million tons, or 46.5%, was “Unspecified, actual and estimated” uses. Of the remaining 58.4 million tons of crushed dolomite reported by uses, 88.7% was used as construction aggregates; 6%, for agricultural uses; 4.1%, for chemical and metallurgical applications; and 1.2%, for special and miscellaneous uses. An additional undefined amount of dolomite consumed in a variety of uses, mostly construction aggregates, is reported with the limestone (table 14).

Marble.—Of the 8.6 million tons of crushed marble consumed, 5.4 million tons, or 62.6%, was reported as “Unspecified, actual and estimated” uses. Of the remaining 3.2 million tons of crushed marble reported by uses, 1.5 million tons, or 47.1%, was used for special and miscellaneous uses, including fillers and extenders, and 1 million tons, or 31.4%, was used as construction aggregates (table 16).

Calcareous Marl.—Of the 4.7 million tons of crushed calcareous marl consumed, 1.1 million tons, or 23.4%, was reported as “Unspecified, actual and estimated” uses. Of the crushed calcareous marl consumed, 3.2 million tons, or 87.9%, was used for cement manufacturing, and 368,000 tons, or 10.2%, was used as construction aggregates.

Shell.—Of the 2.2 million tons of crushed shell consumed, only 307,000 tons, or 14%, was reported as “Unspecified, actual and estimated” uses. Of the remaining 1.9 million tons, most of it was used as construction aggregates.

Granite.—Of the 240 million tons of crushed granite consumed, 111.2 million tons, or 46.3%, was reported as “Unspecified, actual and estimated” uses. Of the remaining 129 million tons, most of it was used as construction aggregates (table 17).

Traprock.—Of the 109 million tons of crushed traprock consumed, 36.2 million tons, or 33.4%, was reported as “Unspecified, actual and estimated” uses. The remaining 72.3 million tons was used as construction aggregates (table 17).

Sandstone and Quartzite.—Of the 29.0 million tons of crushed sandstone consumed, 16.7 million tons, or 59.1%, was reported as “Unspecified, actual and estimated” uses. Of the remaining 12.2 million tons of crushed sandstone reported by uses, 11.2 million tons, or 91.8%, was used as construction aggregates (table 18).

Of the 10.7 million tons of crushed quartzite consumed, 3.6 million tons, or 33.4%, was reported as “Unspecified, actual and estimated” uses. Of the remaining 7.1 million tons of crushed quartzite reported by uses, 94% was used as construction aggregates (table 18).

Volcanic Cinder and Scoria.—Of the 2.5 million tons of

volcanic cinder and scoria consumed, 1.4 million tons, or 54.5%, was reported as "Unspecified, actual and estimated" uses. Most of the remaining 1.1 million tons of crushed volcanic cinder and scoria was used as construction aggregates (table 19).

Miscellaneous Stone.—Of the 47 million tons of miscellaneous crushed stone consumed, 29.5 million tons, or 62.8%, was reported as "Unspecified, actual and estimated" uses. Of the remaining 17.5 million tons reported by uses, 11.6 million tons, or 66.3%, was used as construction aggregates, and 3.8 million tons, or 21.6%, was used for cement manufacturing (table 19).

Additional information regarding production and consumption of crushed stone by type of rock and major uses in each State and the State districts may be found in the USGS "Minerals Yearbook, Volume II, Area Reports: Domestic.

Recycling

As the recycling of most waste materials increases, aggregates producers are recycling more cement concrete and asphalt concrete materials recovered from construction projects to produce concrete aggregates and asphalt aggregates. The annual survey of crushed stone producers now collects information on recycling of cement and asphalt concretes produced by the crushed stone producers only. Information on recycling of these materials by construction or demolition companies is not collected by the USGS.

Asphalt Concrete.—A total of 1.4 million tons of asphalt concrete valued at \$7.3 million was recycled by 65 companies in 29 States. This volume represents a 19.7% decrease compared with that of 1997, despite the fact that the number of companies and States reporting recycling increased compared with 1997 (tables 20-21). The leading recycling States were, in descending order of tonnage, California, Massachusetts, and Maine. The leading recycling companies were, in descending order of tonnage produced, Oldcastle, Doss & Harper Stone Co., and Raisch Products.

Cement Concrete.—A total of 1.6 tons of cement concrete valued at \$8.4 million was recycled by 48 companies in 24 States. This tonnage represents a 145% increase compared with that of 1997 (tables 20-22). The leading recycling States were, in descending order of tonnage, California, Wisconsin, and Virginia. The leading companies were, in descending order of tonnage produced, Vulcan Materials, Babcock Stone Inc., and Dolomite Products Co., Inc.

Prices

Prices in this chapter are average f.o.b. plant, usually at the first point of sale or captive use, as reported by the companies. This value does not include transportation from the plant or yard to the consumer. It does, however, include all costs of mining, processing, in-plant transportation, overhead costs, and profit.

The average unit price per ton of crushed stone decreased by 4.4% to \$5.38, compared with that of 1997. The average unit prices, by kind of stone, decreased between 1.9% for limestone

and 24.6% for slate. The average unit price for calcareous marl increased 30.2% (table 2).

Transportation

For 667 million tons, or 44.1%, of the 1.51 billion tons of crushed stone produced for consumption in 1998, no means of transportation was reported by the producers. Of the remaining 843 million tons of crushed stone, 645 million tons, or 75.6%, was reported as being transported by truck from the processing plant or quarry to the first point of sale or use; 5.8%, by waterway; and 6.3%, by rail. About 8.9% of the specified production was reported as not having been transported and, therefore, is assumed to have been used on-site. Information regarding means of transportation used by the producers to ship crushed stone in each geographic region is provided in table 23.

Foreign Trade

The widespread distribution of domestic crushed stone deposits and the high cost of transportation limits foreign trade to mostly local transactions across international boundaries. U.S. imports and exports are small, representing less than 1% of the domestic consumption. Shipments of crushed stone by water from Canada and especially Mexico, however, continue to increase.

Exports.—Exports of crushed stone increased by 6.8% to 4.4 million tons compared with those of 1997, and the value decreased by 2.8% to \$41.5 million. About 94.7% of the exported crushed stone was limestone. Canada was the major destination with 89.2% of the total crushed stone, followed by Japan with 2%, and Belgium with 1.9% (table 25).

Imports.—Imports of crushed stone increased by 9.7% to 13.6 million tons compared with those of 1997, and the value increased by 9.4% to \$116 million. About 90% of the imported crushed stone was limestone. Imports of natural calcium carbonate fines decreased from 4,000 to 3,000 tons (table 26).

Shipments of crushed stone from The Bahamas, Canada, and Mexico into the United States continued in 1998. The imported crushed stone was used mostly as construction aggregates or for cement manufacturing. This trend is expected to continue, and the volume of imports, especially from Mexico, is expected to increase.

Outlook

The demand for crushed stone in 1999 is expected to be about 1.56 billion tons, or a 3.3% increase over that of 1998. Gradual increases in demand for construction aggregates are anticipated after 1999 as well on the basis of the expected volume of work on the infrastructure that will be financed by the new Transportation Equity Act for the 21st Century and the U.S. economy in general. The projected increases will be influenced by construction activity in the public, as well as the private, construction sectors.

Crushed stone f.o.b. prices are not expected to increase significantly. The delivered prices of crushed stone are, however, expected to increase, especially in and near

metropolitan areas, mainly because more aggregates are transported from distant sources.

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TABLE 1
SALIENT CRUSHED STONE STATISTICS 1/

(Thousand metric tons and thousand dollars)

	1994	1995	1996	1997	1998
Sold or used by producers:					
Quantity 2/	1,230,000	1,260,000	1,330,000	1,410,000 r/	1,510,000
Value 2/	\$6,620,000	\$6,740,000	\$7,180,000	\$7,970,000 r/	\$8,130,000
Exports value	\$38,100	\$39,300	\$36,300	\$42,700	\$41,500
Imports 3/ do.	\$77,800	\$91,900	\$91,800	\$106,000	\$116,000

r/ Revised.

1/ Data are rounded to three significant digits.

2/ Does not include American Samoa, Guam, Puerto Rico, and the U.S. Virgin Islands.

3/ Excludes precipitated calcium carbonate.

TABLE 2
CRUSHED STONE SOLD OR USED IN THE UNITED STATES, BY KIND 1/

Kind	1997				1998			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	2,048 r/	909,000 r/	\$4,700,000 r/	\$5.17 r/	2,162	955,000	\$4,840,000	\$5.07
Dolomite	190 r/	101,000 r/	555,000 r/	5.47 r/	186	109,000	537,000	4.94
Marble	33	7,400	102,000	13.81	62	8,550	115,000	13.45
Shell	9	1,450 r/	7,100 r/	4.89 r/	13	2,200	9,290	4.23
Granite	320 r/	209,000 r/	1,440,000 r/	6.88 r/	376	240,000	1,460,000	6.09
Traprock	407 r/	99,900 r/	641,000 r/	6.42 r/	491	108,000	678,000	6.25
Sandstone and quartzite	176 r/	42,300 r/	270,000 r/	6.38 r/	196	39,800	234,000	5.89
Slate	14 r/	3,400 r/	28,500 r/	8.37 r/	15	4,880	30,800	6.31
Calcareous marl	9 r/	4,740 r/	14,800 r/	3.11 r/	13	4,680	19,000	4.05
Volcanic cinder and scoria	26	2,240 r/	14,900 r/	6.64 r/	43	2,510	15,800	6.29
Miscellaneous stone	119 r/	32,900 r/	198,000 r/	6.01 r/	247	35,200	189,000	5.37
Total	XX	1,410,000 r/	7,970,000 r/	5.64 r/	XX	1,510,000	8,130,000	5.38

r/ Revised. XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes limestone-dolomite reported with no distinction between the two kinds of stone.

TABLE 3
CRUSHED STONE SOLD OR USED IN THE UNITED STATES, BY REGION 1/ 2/

(Thousand metric tons and thousand dollars)

Region/Division	1997		1998	
	Quantity	Value	Quantity	Value
Northeast:				
New England	32,300	231,000	36,600	260,000
Middle Atlantic	156,000	975,000	165,000	944,000
Midwest:				
East North Central	270,000 r/	1,280,000 r/	285,000	1,300,000
West North Central	156,000	831,000 r/	159,000	837,000
South:				
South Atlantic	337,000 r/	2,160,000 r/	360,000	2,110,000
East South Central	171,000 r/	950,000 r/	173,000	1,050,000
West South Central	147,000 r/	654,000 r/	174,000	732,000
West:				
Mountain	48,400	276,000	52,800	268,000
Pacific	94,500	611,000	105,000	637,000
Total	1,410,000 r/	7,970,000 r/	1,510,000	8,130,000

r/ Revised.

1/ Includes volcanic cinder and scoria.

2/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 4
CRUSHED STONE SOLD OR USED BY PRODUCERS IN THE UNITED STATES IN 1998,
BY QUARTER AND DIVISION 1/

Region/Division	Quantity 1st quarter (thousand metric tons)	Percentage change 3/	Quantity 2d quarter (thousand metric tons)	Percentage change 3/	Quantity 3d quarter (thousand metric tons)	Percentage change 3/	Quantity 4th quarter (thousand metric tons)	Percentage change 3/	Total 2/ (thousand metric tons)	Value total 2/ (thousands)
Northeast:										
New England	3,100	30.2	10,700	19.6	12,500	4.9	10,500	16.9	36,800	\$268,000
Middle Atlantic	22,200	8.6	45,000	2.0	55,800	6.0	44,100	12.6	167,000	1,040,000
Midwest:										
East North Central	36,800	5.7	78,200	7.7	90,200	1.1	78,700	7.9	284,000	1,390,000
West North Central	27,600	11.1	46,000	5.3	49,500	2.9	41,900	5.9	165,000	873,000
South:										
South Atlantic	70,000	-0.4	96,100	4.6	105,000	11.2	97,100	17.9	368,000	2,340,000
East South Central	32,900	9.5	46,300	2.6	53,000	2.9	46,700	7.2	179,000	998,000
West South Central	34,700	18.6	43,400	12.8	45,100	8.8	39,500	7.5	163,000	728,000
West:										
Mountain	10,200	25.9	15,500	17.8	15,800	10.9	12,400	-0.1	53,900	310,000
Pacific 4/	18,000	5.1	23,800	13.7	27,100	9.3	24,700	8.9	93,600	582,000
Total 5/	256,000	7.7	405,000	6.9	454,000	6.0	396,000	10.4	1,530,000	8,660,000

1/ As published in the "Crushed Stone and Sand and Gravel in the Fourth Quarter of 1998 Mineral Industry Surveys."

2/ Data may not add to totals shown because of independent rounding and differences between projected totals by States and regions.

3/ All percentage changes are calculated by using unrounded totals. Percentage changes are based on the corresponding quarter of the previous year.

4/ Does not include Alaska and Hawaii.

5/ Includes Alaska, Hawaii, and "Other"; see table 6.

TABLE 5
CRUSHED STONE SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY STATE 1/ 2/

State	1997			1998		
	Quantity (thousand metric tons)	Value (thousands)	Unit value	Quantity (thousand metric tons)	Value (thousands)	Unit value
Alabama	42,000	\$273,000	\$6.51	48,900	\$383,000	\$7.83
Alaska 3/	3,340 4/ 5/ 6/	23,500 4/ 5/ 6/	7.06	1,700 4/ 5/ 6/	9,970 4/ 5/ 6/	5.86
Arizona	7,490	44,000	5.86	8,080	44,800	5.54
Arkansas	28,100	167,000	5.94	35,700	180,000	5.05
California	49,600	325,000	6.56	55,100	344,000	6.25
Colorado	9,720	60,800	6.26	12,000	63,800	5.34
Connecticut	5,760	55,300	9.60	7,660	69,400	9.06
Florida	73,600 7/	394,000 7/	5.36 7/	81,000 7/	377,000 7/	4.65
Georgia	65,600 7/ 8/	431,000 7/ 8/	6.57 7/	74,200 8/	440,000 8/	5.93
Hawaii	5,560	59,500	10.71	5,500	53,900	9.79
Idaho	3,910 9/	18,700 9/	4.78	4,180	18,400	4.39
Illinois	65,700	357,000	5.44	72,100 10/	371,000 10/	5.14
Indiana	59,000 5/	281,000 7/ 5/	4.75	61,600 11/	283,000 11/	4.58
Iowa	37,300	215,000	5.76	41,800	219,000	5.25
Kansas	23,000	116,000	5.04	21,800	115,000	5.28
Kentucky	63,200 7/ 10/	294,000 7/ 10/	4.65	59,500 12/	291,000 12/	4.88
Louisiana	4,420 7/ 12/	30,200 7/ 12/	6.84 7/	W 10/	W 10/	W
Maine	2,540	15,100	5.93	4,120	23,000	5.58
Maryland	24,500 6/ 8/ 11/	160,000 6/ 8/ 11/	6.52	24,300 6/ 8/ 11/	141,000 6/ 8/ 11/	5.78
Massachusetts	12,200 12/	91,300 12/	7.46	12,800	96,900	7.59
Michigan	42,000 7/ 12/	157,000 7/ 12/	3.74	43,700 7/ 12/	167,000 7/ 12/	3.82
Minnesota	14,600	75,000	5.15	13,600 10/	71,500 10/	5.26
Mississippi	5,180 7/	32,900 7/	6.36	789 7/	2,790 7/	3.54
Missouri	68,400 7/	349,000 7/	5.10 7/	68,400	356,000	5.21
Montana	2,600	10,600	4.09	3,880	15,100	3.88
Nebraska	6,900	46,000	6.67	7,490	49,800	6.65
Nevada	5,150	41,800	8.12	6,320	34,000	5.38
New Hampshire	2,010 7/ 10/	12,500 7/ 10/	6.25 7/	4,190 10/	27,500 10/	6.58
New Jersey	22,800	153,000	6.71	23,900	161,000	6.77
New Mexico	2,920 11/	15,700 11/	5.36	4,940 10/ 11/	21,000 10/ 11/	4.25
New York	44,400	285,000	6.43	47,200	279,000	5.91
North Carolina	64,300 7/	468,000 7/	7.27 7/	69,700	480,000	6.89
North Dakota	-	-	-	71 13/	232 13/	3.27
Ohio	74,100	357,000 7/	4.82 7/	75,600	352,000	4.65
Oklahoma	32,200 7/ 6/ 14/	109,000 7/ 6/ 14/	3.37 7/	38,500	152,000	3.95
Oregon	21,200	110,000	5.17	23,200	118,000	5.08
Pennsylvania	89,200	536,000	6.01	94,500	504,000	5.34
Rhode Island	1,830	11,500	6.30	2,240	14,200	6.35
South Carolina	25,900	202,000	7.79	28,000	182,000	6.50
South Dakota	5,900	30,200	5.11	5,720	24,600	4.31
Tennessee	60,400	349,000	5.79	63,600	370,000	5.83
Texas	81,000 7/	338,000 7/	4.17 7/	99,300	397,000	4.00
Utah	11,100	50,200	4.51	7,820	39,500	5.06
Vermont	7,840	44,500	5.67	5,590	28,500	5.10
Virginia	61,300 7/	377,000 7/	6.14 7/	65,900	390,000	5.92
Washington	14,700	92,200	6.25	19,400	111,000	5.74
West Virginia	12,900 15/	76,700 15/	5.95	12,300 15/	68,100 15/	5.55
Wisconsin	28,700	120,000	4.16	31,200	127,000	4.07
Wyoming	5,010	30,700	6.13	5,580	31,600	5.66
Other	12,300 7/	75,100 7/	6.12 7/	5,630	33,200	5.90
Total	1,410,000 7/	7,970,000 7/	5.64 7/	1,510,000	8,130,000	5.38

7/ Revised. W Withheld to avoid disclosing company proprietary data..

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ To avoid disclosing company proprietary data, certain State totals do not include all types of stone produced within the State; the portion not shown has been included with "Other."

3/ Data derived, in part, from Alaska Division of Geological and Geophysical Surveys information.

4/ Excludes limestone-dolomite.

5/ Excludes slate.

6/ Excludes shell.

7/ Excludes calcareous marl.

8/ Excludes marble.

9/ Excludes quartzite.

10/ Excludes sandstone.

11/ Excludes traprock.

12/ Excludes miscellaneous stone.

13/ Excludes volcanic cinder.

14/ Excludes granite.

15/ Excludes dolomite.

TABLE 6
CRUSHED STONE SOLD OR USED BY PRODUCERS IN THE UNITED STATES IN 1998,
BY QUARTER AND STATE 1/

State	Quantity 1st quarter (thousand metric tons)	Percentage change 3/	Quantity 2d quarter (thousand metric tons)	Percentage change 3/	Quantity 3d quarter (thousand metric tons)	Percentage change 3/	Quantity 4th quarter (thousand metric tons)	Percentage change 3/	Total 2/ (thousand metric tons)	Value total 2/ (thousands)
Alabama	9,700	7.7	11,600	5.4	12,500	12.7	11,000	1.3	44,800	\$291,000
Alaska 4/ 5/	—	—	—	—	—	—	—	—	3,200	22,500
Arizona 6/	—	—	—	—	—	—	—	—	7,490	44,000
Arkansas	6,000	23.6	8,300	14.2	8,200	-4.1	6,500	-11.4	29,100	173,000
California	11,000	13.9	14,200	18.2	16,500	20.6	15,800	10.9	57,500	377,000
Colorado	2,400	21.1	3,600	35.5	3,300	13.4	2,300	4.1	11,500	71,900
Connecticut	300	60.1	2,900	67.2	2,600	19.1	2,300	38.8	8,100	77,800
Delaware 4/	—	—	—	—	—	—	—	—	—	—
Florida 5/	20,300	14.4	21,100	16.8	20,800	7.0	21,200	14.0	83,400	448,000
Georgia 5/	14,500	6.3	19,500	13.7	21,800	17.5	20,300	27.9	76,200	501,000
Hawaii 4/	—	—	—	—	—	—	—	—	5,000	53,500
Idaho 5/	400	30.6	700	-16.6	1,100	-18.1	1,600	16.7	3,860	18,500
Illinois	8,300	11.8	17,900	1.8	22,600	3.3	20,300	7.8	69,100	375,000
Indiana 5/	9,800	-8.6	16,100	8.8	19,600	7.6	17,000	11.2	62,500	297,000
Iowa	5,800	9.3	11,900	3.9	12,700	13.8	11,500	22.3	41,900	242,000
Kansas	4,500	1.9	6,600	3.5	6,000	-9.2	4,900	-11.8	22,000	111,000
Kentucky 5/	10,600	18.9	15,600	-3.3	19,500	-10.0	17,900	12.2	63,600	296,000
Louisiana 5/ 6/	—	—	—	—	—	—	—	—	4,600	30,400
Maine	300	8.7	800	19.6	1,100	6.9	700	29.4	2,930	17,400
Maryland 5/	3,700	-13.7	6,300	-9.7	7,300	2.7	6,300	3.3	23,600	154,000
Massachusetts 5/	1,300	36.4	3,800	10.7	4,300	-0.8	4,000	18.3	13,500	101,000
Michigan 5/	3,300	16.3	13,400	10.2	13,100	-9.5	12,900	3.1	42,700	160,000
Minnesota	700	8.5	4,500	11.0	6,000	1.2	3,500	-12.3	14,700	75,500
Mississippi 5/ 6/	—	—	—	—	—	—	—	—	5,150	32,700
Missouri	15,100	17.8	18,800	4.4	20,800	5.9	19,700	9.4	74,400	380,000
Montana 6/	—	—	—	—	—	—	—	—	2,680	10,900
Nebraska	1,400	7.7	2,200	7.0	2,000	-5.2	1,600	9.9	7,170	47,800
Nevada	1,200	-17.5	1,300	13.2	1,600	32.2	1,500	6.1	5,530	44,900
New Hampshire 5/	200	30.9	600	17.4	700	8.3	700	-2.6	2,130	13,300
New Jersey	3,700	15.3	6,300	9.2	7,500	5.1	6,800	2.6	24,400	164,000
New Mexico 5/	1,000	79.6	1,700	84.9	1,400	86.9	600	-24.6	4,580	24,600
New York	4,100	9.9	13,300	2.7	17,500	0.6	12,100	17.1	47,000	304,000
North Carolina	12,100	-3.8	17,900	-0.4	19,400	8.5	17,300	12.5	66,600	485,000
North Dakota 4/	—	—	—	—	—	—	—	—	—	—
Ohio	12,600	13.9	23,000	14.1	25,300	3.1	19,900	9.0	80,900	433,000
Oklahoma 5/	7,200	7.1	9,100	3.4	9,600	10.0	10,000	30.1	35,900	126,000
Oregon	3,700	-13.3	5,400	-4.0	6,300	-5.8	4,600	-1.2	20,000	104,000
Pennsylvania	14,400	6.8	25,300	0.2	30,800	9.3	25,200	13.4	95,700	575,000
Rhode Island 4/	—	—	—	—	—	—	—	—	1,830	11,500
South Carolina	5,800	2.9	7,300	3.1	7,700	11.0	7,200	15.6	28,000	218,000
South Dakota	700	7.2	1,800	12.1	2,100	-5.9	1,400	-0.4	6,000	23,100
Tennessee	10,700	6.9	17,000	5.2	19,700	6.4	17,000	8.2	64,400	\$372,000
Texas	20,500	24.0	25,200	19.5	26,300	15.5	21,600	4.2	93,700	400,000
Utah	2,000	23.4	3,100	12.1	3,200	-6.8	2,000	-39.9	10,200	46,100

See footnotes at end of table.

TABLE 6--Continued
CRUSHED STONE SOLD OR USED BY PRODUCERS IN THE UNITED STATES IN 1998,
BY QUARTER AND STATE 1/

State	Quantity 1st quarter (thousand metric tons)	Percentage change 3/	Quantity 2d quarter (thousand metric tons)	Percentage change 3/	Quantity 3d quarter (thousand metric tons)	Percentage change 3/	Quantity 4th quarter (thousand metric tons)	Percentage change 3/	Total 2/ (thousand metric tons)	Value total 2/ (thousands)
Vermont 6/	—	—	—	—	—	—	—	—	8,350	\$47,600
Virginia	12,200	-16.9	20,500	-1.3	23,800	16.4	21,700	28.3	78,200	460,000
Washington	3,200	-6.6	4,100	23.9	3,900	-16.6	3,800	12.2	14,900	93,500
West Virginia 5/	1,800	-20.0	3,600	-1.5	4,100	5.0	3,100	1.4	12,600	74,900
Wisconsin	2,800	5.7	7,600	-4.5	9,800	-5.7	8,300	7.7	28,500	119,000
Wyoming	1,000	62.2	1,700	-3.9	1,800	22.6	1,700	50.3	6,250	38,300
Other	—	—	—	—	—	—	—	—	11,000	63,200
Total 3/	XX	XX	XX	XX	XX	XX	XX	XX	1,530,000	8,660,000

XX Not applicable.

1/ As published in the "Crushed Stone and Sand and Gravel in the Fourth Quarter of 1998 Mineral Industry Surveys."

2/ Data may not add to totals shown because of independent rounding and differences between projected totals by States and regions.

3/ All percentage changes are calculated by using unrounded totals. Percentage changes are based on the corresponding quarter of 1997.

4/ State not included in quarterly survey.

5/ To avoid disclosing proprietary data, certain State totals do not include all types of stone produced within the State; the portion not shown has been included with "Other."

6/ Owing to the low number of companies, no production estimates by quarter were generated.

TABLE 7
CRUSHED STONE SOLD OR USED IN THE UNITED STATES IN 1998,
BY REGION AND SIZE OF OPERATION 1/

Size range (metric tons)	Northeast				Midwest				South			
	Number of operations	Percentage of total	Quantity (thousand metric tons)	Percentage of total	Number of operations	Percentage of total	Quantity (thousand metric tons)	Percentage of total	Number of operations	Percentage of total	Quantity (thousand metric tons)	Percentage of total
Less than 25,000	44	9.7	374	0.2	180	15.5	1,770	0.4	56	5.2	430	0.1
25,000 to 49,999	27	5.9	944	0.4	85	7.0	3,000	0.5	39	3.6	1,390	0.2
50,000 to 99,999	41	9.0	2,840	1.4	179	15.4	12,100	2.7	112	10.4	7,910	1.1
100,000 to 199,999	58	12.7	7,980	4.0	176	15.2	23,200	5.2	124	11.5	17,100	2.4
200,000 to 299,999	34	7.5	7,590	3.8	126	10.9	28,000	6.3	97	9.0	21,900	3.1
300,000 to 399,999	51	11.2	16,000	8.0	78	6.7	24,700	5.6	85	7.9	27,200	3.9
400,000 to 499,999	45	9.9	18,400	9.1	54	4.7	21,800	4.9	80	7.4	32,700	4.6
500,000 to 599,999	28	6.1	14,200	7.0	37	3.2	18,600	4.2	70	6.5	35,300	5.0
600,000 to 699,999	28	6.1	16,700	8.0	38	3.3	22,300	5.0	43	4.0	25,600	3.6
700,000 to 799,999	15	3.3	10,200	5.1	32	2.8	21,800	4.9	44	4.1	29,700	4.2
800,000 to 899,999	16	3.5	12,200	6.1	28	2.4	21,500	4.8	48	4.5	37,100	5.3
900,000 to 999,999	11	2.4	9,490	4.7	26	2.2	22,500	5.1	37	3.4	32,000	4.5
1,000,000 to 1,499,999	38	8.3	42,300	20.9	62	5.4	70,400	15.9	119	11.0	132,000	18.6
1,500,000 to 1,999,999	9	2.0	13,200	6.5	25	2.2	39,000	8.8	69	6.4	107,000	15.1
2,000,000 to 2,499,999	2	0.4	3,890	2.0	14	1.2	28,200	6.4	16	1.5	33,000	4.7
2,500,000 to 4,999,999	9	2.0	25,800	12.8	15	1.3	45,400	10.3	30	2.8	92,800	13.1
5,000,000 and over	—	—	—	—	6	0.6	39,800	9.0	10	0.8	74,000	10.5
Total	456	100.0	202,000	100.0	1,160	100.0	443,000	100.0	1,080	100.0	707,000	100.0

Size range (metric tons)	West				U.S. total			
	Number of operations	Percentage of total	Quantity (thousand metric tons)	Percentage of total	Number of operations	Percentage of total	Quantity (thousand metric tons)	Percentage of total
Less than 25,000	211	29.8	1,600	1.0	491	14.4	4,170	0.2
25,000 to 49,999	90	12.7	2,970	1.9	241	7.1	8,310	0.5
50,000 to 99,999	104	14.7	7,070	4.5	436	12.8	29,900	2.0
100,000 to 199,999	107	15.1	14,200	9.0	465	13.7	62,500	4.1
200,000 to 299,999	50	7.1	11,000	7.0	307	9.0	68,500	4.5
300,000 to 399,999	36	5.1	11,500	7.3	250	7.3	79,400	5.3
400,000 to 499,999	20	2.8	8,110	5.1	199	5.8	81,100	5.4
500,000 to 599,999	17	2.4	8,480	5.4	152	4.5	76,500	5.1
600,000 to 699,999	15	2.1	8,740	5.5	124	3.6	73,300	4.9
700,000 to 799,999	7	1.0	4,680	3.0	97	2.9	65,800	4.4
800,000 to 899,999	5	0.8	3,890	2.5	97	2.9	74,800	5.0
900,000 to 999,999	10	1.4	8,490	5.4	84	2.5	72,500	4.8
1,000,000 to 1,499,999	21	3.0	23,200	14.7	241	7.1	268,000	17.7
1,500,000 to 1,999,999	3	0.3	4,930	3.0	106	3.1	164,000	10.9
2,000,000 to 2,499,999	3	0.3	6,450	4.1	35	1.0	71,600	4.7
2,500,000 to 4,999,999	10	1.4	32,500	20.6	64	1.9	197,000	13.0
5,000,000 and over	—	—	—	—	16	0.4	114,000	7.5
Total	709	100.0	158,000	100.0	3,410	100.0	1,510,000	100.0

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 8
CRUSHED LIMESTONE AND DOLOMITE SOLD OR USED BY PRODUCERS IN
THE UNITED STATES IN 1998, BY STATE 1/

(Thousand metric tons and thousand dollars)

State	Limestone		Dolomite	
	Quantity	Value	Quantity	Value
Alabama	42,900 2/	286,000 2/	W	W
Alaska 3/	W 2/	W 2/	--	--
Arizona	4,300	23,900	--	--
Arkansas	13,300	61,900	W	W
California	24,800	149,000	252	1,060
Colorado	2,470	16,200	--	--
Connecticut	W	W	W	W
Florida	77,700 2/	360,000 2/	1,310	8,330
Georgia	17,600 2/	111,000 2/	W	W
Hawaii	357	2,160	--	--
Idaho	1,040	4,030	--	--
Illinois	55,100 2/	291,000 2/	17,000	79,800
Indiana	48,300 2/	220,000 2/	11,500	51,900
Iowa	41,700 2/	219,000 2/	72	W
Kansas	21,200 2/	109,000 2/	--	--
Kentucky	59,500	291,000	--	--
Maine	1,360	8,020	--	--
Maryland	18,300	102,000	--	--
Massachusetts	2,170 2/	21,000 2/	--	--
Michigan	34,700	133,000	8,970	33,500
Minnesota	7,180	37,300	W	W
Mississippi	789	2,790	--	--
Missouri	64,400 2/	335,000 2/	2,770	13,200
Montana	3,370	13,200	--	--
Nebraska	7,490	49,800	--	--
Nevada	5,050	23,000	W	W
New Jersey	W	W	--	--
New Mexico	2,200	8,630	--	--
New York	29,500 2/	169,000 2/	8,250	50,400
North Carolina	W	W	279	1,870
Ohio	61,500 2/	283,000 2/	12,500	59,900
Oklahoma	27,500	108,000	1,560	6,570
Oregon	W	W	--	--
Pennsylvania	54,300 2/	303,000 2/	17,500	82,900
Rhode Island	W	W	--	--
South Carolina	W	W	--	--
South Dakota	2,920	12,100	--	--
Tennessee	56,800	329,000	W	W
Texas	92,500	370,000	W	W
Utah	3,100 2/	18,200 2/	W	W
Vermont	2,580	11,400	W	W
Virginia	18,500 2/	103,000 2/	3,800	22,600
Washington	1,020 2/	6,220 2/	W	W
West Virginia	11,300	61,400	W	W
Wisconsin	22,500 2/	94,100 2/	2,350	10,100
Wyoming	W 2/	W 2/	W	W
Other	13,700 2/	93,400 2/	20,700	115,000
Total	955,000	4,840,000	109,000	537,000

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes limestone-dolomite reported with no distinction between the two kinds of stone.

3/ Data derived, in part, from Alaska Division of Geological and Geophysical Surveys information.

TABLE 9
CRUSHED CALCAREOUS MARL AND MARBLE SOLD OR USED BY
PRODUCERS IN THE UNITED STATES IN 1998, BY STATE 1/

(Thousand metric tons and thousand dollars)

State	Calcareous marl		Marble	
	Quantity	Value	Quantity	Value
Alabama	--	--	2,240	76,300
New York	--	--	90	1,580
Pennsylvania	--	--	363	2,170
South Carolina	3,170	12,900	W	W
Vermont	--	--	1,540	6,610
Other	1,520 2/	6,020 2/	4,310 3/	28,300 3/
Total	4,680	19,000	8,550	115,000

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes data for Florida, Michigan, Mississippi, North Carolina, and Texas.

3/ Includes data for Arizona, California, Georgia, Maryland, Oregon, South Carolina, Texas, Washington, and Wyoming.

TABLE 10
CRUSHED GRANITE, TRAPROCK, AND SANDSTONE AND QUARTZITE SOLD OR USED BY PRODUCERS
IN THE UNITED STATES IN 1998, BY STATE 1/

(Thousand metric tons and thousand dollars)

State	Granite		Traprock		Sandstone and quartzite	
	Quantity	Value	Quantity	Value	Quantity	Value
Alabama	W	W	--	--	W	W
Alaska 2/	--	--	605	2,700	W	W
Arizona	2,190	10,900	--	--	280	3,030
Arkansas	12,300	64,100	--	--	7,650	42,600
California	10,400	51,500	9,740	74,400	2,810	25,900
Colorado	6,090	29,100	W	W	651	3,450
Connecticut	143	1,150	W	W	--	--
Florida	--	--	--	--	W	W
Georgia	56,100	326,000	--	--	W	W
Hawaii	582	2,490	4,030	44,600	W	W
Idaho	256	911	1,900	8,960	W	W
Illinois	--	--	--	--	W	W
Indiana	--	--	W	W	--	--
Kansas	W	W	--	--	W	W
Louisiana	--	--	--	--	W	W
Maine	478	3,410	W	W	W	W
Maryland	W	W	W	W	W	W
Massachusetts	3,140	22,800	7,230	51,400	--	--
Michigan	--	--	W	W	7	113
Minnesota	W	W	--	--	W	W
Missouri	W	W	W	W	W	W
Montana	--	--	W	W	88	296
Nevada	W	W	W	W	--	--
New Hampshire	W	W	W	W	W	W
New Jersey	9,830	62,800	12,200	86,600	W	W
New Mexico	W	W	W	W	W	W
New York	2,770	21,500	W	W	1,550	11,300
North Carolina	52,800	365,000	6,180	43,400	W	W
Ohio	--	--	--	--	1,640	9,340
Oklahoma	W	W	--	--	1,210	4,450
Oregon	165	777	19,400	97,300	W	W
Pennsylvania	3,710	19,000	3,160	15,400	7,100	37,800
Rhode Island	1,610	10,500	W	W	--	--
South Carolina	20,400	137,000	--	--	--	--
South Dakota	W	W	--	--	2,710	12,100
Tennessee	W	W	--	--	W	W
Texas	W	W	W	W	938	4,070
Utah	W	W	--	--	335	1,740
Vermont	W	W	--	--	1,270	8,980
Virginia	28,600	186,000	11,400	59,300	2,460	12,000
Washington	W	W	15,000	83,000	788	8,220
West Virginia	--	--	--	--	1,020	6,710
Wisconsin	2,210	6,530	1,790	7,070	W	W
Wyoming	W	W	--	--	W	W
Other	26,400	141,000	15,900	104,000	7,280	42,200
Total	240,000	1,460,000	108,000	678,000	39,800	234,000

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Data derived, in part, from Alaska Division of Geological and Geophysical Surveys information.

TABLE 11
CRUSHED VOLCANIC CINDER AND SCORIA AND CRUSHED
MISCELLANEOUS STONE SOLD OR USED BY PRODUCERS
IN THE UNITED STATES IN 1998, BY STATE 1/

(Thousand metric tons and thousand dollars)

State	Volcanic cinder and scoria		Miscellaneous stone 2/	
	Quantity	Value	Quantity	Value
Alabama	--	--	67	477
Alaska 3/	--	--	1,100	7,270
Arizona	333	1,610	957	5,270
Arkansas	--	--	106	583
California	538	3,370	6,190	35,000
Colorado	28	125	2,230	12,200
Connecticut	--	--	W	W
Hawaii	W	W	W	W
Idaho	--	--	497	2,320
Indiana	--	--	--	--
Kentucky	--	--	W	W
Louisiana	--	--	--	--
Maine	--	--	836	4,420
Massachusetts	--	--	228	1,610
Michigan	--	--	W	W
Montana	--	--	66	219
Nevada	W	W	674	7,000
New Jersey	--	--	W	W
New Mexico	290	2,820	980	4,350
New York	--	--	1,200	7,340
North Carolina	W	W	W	W
North Dakota	W	W	70	232
Oklahoma	--	--	1,500	7,130
Oregon	--	--	2,730	13,100
Pennsylvania	--	--	8,200	43,400
Texas	W	W	3,260	10,800
Utah	W	W	257	1,360
Virginia	--	--	954	5,960
Washington	200	1,120	820	4,460
Wyoming	W	W	332	1,290
Other	1,120	6,760	9,050	53,600
Total	2,510	15,800	42,300	229,000

W Withheld to avoid disclosing company proprietary data; included with "Other."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes shell and slate.

3/ Data derived, in part, from Alaska Division of Geological and Geophysical Surveys information.

TABLE 12
KIND OF CRUSHED STONE PRODUCED IN THE UNITED STATES IN 1998, BY STATE

State	Lime- stone	Dolo- mite	Marble	Calcareous marl	Shell	Granite	Trap- rock	Sand- stone	Quartzite	Slate	Volcanic cinder and scoria	Miscella- neous
Alabama	X	X	X			X		X		X		X
Alaska 1/	X				X		X			X		X
Arizona	X		X			X		X	X		X	X
Arkansas	X	X				X		X	X	X		X
California	X	X	X		X	X	X	X	X	X	X	X
Colorado	X					X	X	X	X		X	X
Connecticut	X	X				X	X					X
Florida	X	X		X	X			X				
Georgia	X	X	X			X			X			
Hawaii	X					X	X	X			X	X
Idaho	X				X	X	X		X			X
Illinois	X	X						X				
Indiana	X	X					X			X		
Iowa	X	X										
Kansas	X					X		X	X			
Kentucky	X											X
Louisiana								X				
Maine	X					X	X		X	X		X
Maryland	X		X		X	X	X	X				
Massachusetts	X					X	X					X
Michigan	X	X		X			X	X				X
Minnesota	X	X				X		X	X			
Mississippi	X			X								
Missouri	X	X				X	X	X				
Montana	X						X	X	X		X	X
Nebraska	X											
Nevada	X	X				X	X				X	X
New Hampshire						X	X	X				
New Jersey	X					X	X	X				X
New Mexico	X					X	X	X			X	X
New York	X	X	X			X	X	X				X
North Carolina	X	X		X		X	X		X	X	X	X
North Dakota											X	X
Ohio	X	X						X				
Oklahoma	X	X				X		X				X
Oregon	X		X			X	X	X				X
Pennsylvania	X	X	X			X	X	X	X	X		X
Rhode Island	X					X	X					
South Carolina	X		X	X		X						
South Dakota	X					X			X			
Tennessee	X	X				X		X				
Texas	X	X	X	X		X	X	X	X		X	X
Utah	X	X				X		X	X		X	X
Vermont	X	X	X			X			X	X		
Virginia	X	X				X	X	X	X	X		X
Washington	X	X	X		X	X	X	X			X	X
West Virginia	X	X						X				
Wisconsin	X	X				X	X	X	X			
Wyoming	X	X	X			X			X		X	X

1/ Data derived, in part, from Alaska Division of Geological and Geophysical Surveys information.

TABLE 13
CRUSHED STONE SOLD OR USED BY PRODUCERS IN THE UNITED
STATES IN 1998, BY USE 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1-1/2-inch):			
Macadam	5,100	\$29,000	\$5.68
Riprap and jetty stone	17,200	116,000	6.74
Filter stone	7,290	43,800	6.01
Other coarse aggregate	15,600	75,400	4.83
Coarse aggregate, graded:			
Concrete aggregate, coarse	95,900	549,000	5.72
Bituminous aggregate, coarse	75,400	473,000	6.27
Bituminous surface-treatment aggregate	18,500	117,000	6.33
Railroad ballast	16,900	80,300	4.75
Other graded coarse aggregate	69,000	430,000	6.21
Fine aggregate (-3/8 inch):			
Stone sand, concrete	16,000	91,400	5.70
Stone sand, bituminous mix or seal	20,400	110,000	5.41
Screening, undesignated	25,000	124,000	4.95
Other fine aggregate	16,900	83,100	4.91
Coarse and fine aggregates:			
Graded road base or subbase	168,000	806,000	4.80
Unpaved road surfacing	23,200	111,000	4.79
Terrazzo and exposed aggregate	2,410	15,300	6.37
Crusher run or fill or waste	44,000	205,000	4.65
Roofing granules	3,690	21,200	5.75
Other coarse and fine aggregates	55,100	283,000	5.13
Other construction materials 2/	15,900	81,100	5.11
Agricultural:			
Agricultural limestone	12,200	67,700	5.53
Poultry grit and mineral food	802	7,140	8.91
Other agricultural uses	1,080	9,140	8.43
Chemical and metallurgical:			
Cement manufacture	94,600	407,000	4.30
Lime manufacture	23,600	155,000	6.56
Dead-burned dolomite manufacture	654	3,500	5.35
Flux stone	6,880	30,600	4.45
Chemical stone	488	2,190	4.49
Glass manufacture	443	6,720	15.16
Sulfur oxide removal	1,660	10,600	6.42
Special:			
Mine dusting or acidic water treatment	374	5,170	13.83
Asphalt fillers or extenders	1,560	13,600	8.68
Whiting or whiting substitute	1,020	47,200	46.05
Other fillers or extenders	4,700	109,000	23.18
Other miscellaneous uses:			
Abrasives	W	W	W
Flour (slate)	W	W	W
Sugar refining	W	W	W
Other specified uses not listed 3/	2,980	21,800	7.30
Unspecified: 4/			
Actual	440,000	2,360,000	5.37
Estimated	205,000	1,020,000	4.97
Total	1,510,000	8,130,000	5.38

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes building products, drain fields, lightweight aggregate (slate), pipe bedding, and waste material.

3/ Includes refractory stone, including ganister.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 14
CRUSHED LIMESTONE AND DOLOMITE SOLD OR USED BY PRODUCERS IN THE
UNITED STATES IN 1998, BY USE 1/

(Thousand metric tons and thousand dollars)

Use	Limestone 2/		Dolomite	
	Quantity	Value	Quantity	Value
Coarse aggregate (+1-1/2 inch):				
Macadam	3,360	18,600	508	2,750
Riprap and jetty stone	9,110	54,600	872	6,200
Filter stone	4,500	23,000	176	1,070
Other coarse aggregate	10,600	48,600	573	2,990
Coarse aggregate, graded:				
Concrete aggregate, coarse	60,800	326,000	6,790	34,800
Bituminous aggregate, coarse	46,800	282,000	6,100	36,300
Bituminous surface-treatment aggregate	11,200	62,200	1,860	12,000
Railroad ballast	2,260	11,000	626	3,220
Other graded coarse aggregate	40,000	232,000	4,970	21,400
Fine aggregate (-3/8 inch):				
Stone sand, concrete	8,930	46,600	1,380	8,210
Stone sand, bituminous mix or seal	9,360	46,700	1,330	7,710
Screening, undesignated	14,500	68,900	2,530	12,200
Other fine aggregate	12,600	59,800	531	2,470
Coarse and fine aggregates:				
Graded road base or subbase	112,000	497,000	11,100	53,600
Unpaved road surfacing	14,900	74,200	1,170	4,630
Terrazzo and exposed aggregate	702	3,810	112	651
Crusher run or fill or waste	22,400	92,300	1,920	9,910
Other coarse and fine aggregates	32,100	169,000	8,680	36,400
Roofing granules	237	2,250	W	W
Other construction materials 3/	11,500	54,900	W	W
Agricultural:				
Agricultural limestone	8,820	50,300	3,420	17,400
Poultry grit and mineral food	771	6,820	--	--
Other agricultural uses	754	6,300	88	755
Chemical and metallurgical:				
Cement manufacture	90,000	386,000	186	1,260
Lime manufacture	22,300	149,000	1,280	4,640
Dead-burned dolomite manufacture	654	3,500	--	--
Flux stone	5,790	25,400	933	3,470
Chemical stone	488	2,190	--	--
Glass manufacture	88	917	W	W
Sulfur oxide removal	1,660	10,600	--	--
Special:				
Mine dusting or acidic water treatment	325	4,620	W	W
Asphalt fillers or extenders	1,490	12,700	72	829
Whiting or whiting substitute	298	7,600	W	W
Other fillers or extenders	3,350	69,000	188	5,140
Other miscellaneous uses:				
Abrasives	W	W	--	--
Sugar refining	W	W	--	--
Other specified uses not listed 4/	1,790	12,000	W	W
Unspecified: 5/				
Actual	252,000	1,270,000	42,000	199,000
Estimated	137,000	661,000	8,650	42,300
Total	955,000	4,840,000	109,000	537,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes a minor amount of limestone-dolomite reported without a distinction between the two.

3/ Includes building products, drain fields, pipe bedding, and waste material.

4/ Includes refractory stone, including ganister.

5/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 15
CRUSHED LIMESTONE AND DOLOMITE SOLD OR USED BY PRODUCERS
IN 1998, BY STATE AND USE 1/

(Thousand metric tons and thousand dollars)

State	Concrete aggregate		Bituminous aggregate		Roadstone and coverings		Riprap and railroad ballast		Other construction uses	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Alabama	2,460	13,900	7,990	46,500	676	4,890	103	624	6,390	35,300
Alaska	--	--	--	--	--	--	--	--	--	--
Arizona	--	--	W	W	--	--	--	--	W	W
Arkansas	2,070	9,390	3,580	19,400	4,270	17,600	242	1,160	2,240	10,300
California	922	4,480	575	5,520	695	2,970	302	1,750	348	1,770
Colorado	--	--	W	W	W	W	--	--	--	--
Connecticut	W	W	W	W	W	W	--	--	W	W
Florida	11,100	67,600	6,570	38,300	12,900	47,500	94	719	12,400	50,300
Georgia	1,330	8,850	1,300	9,010	856	4,040	75	735	384	2,200
Hawaii	114	564	--	--	W	W	--	--	W	W
Idaho	--	--	--	--	--	--	--	--	--	--
Illinois	6,350	35,600	7,830	48,600	15,100	75,800	944	6,550	4,950	22,600
Indiana	5,000	23,400	6,620	29,800	4,550	22,400	1,060	5,410	2,480	10,100
Iowa	1,160	6,700	690	4,350	6,160	32,600	88	492	1,580	6,970
Kansas	659	3,580	2,550	16,700	1,750	8,860	96	696	4,610	26,700
Kentucky	3,250	18,600	7,370	47,100	4,830	26,500	635	4,180	3,650	19,000
Maine	W	W	W	W	--	--	W	W	--	--
Maryland	958	7,170	233	1,630	1,390	6,710	146	1,300	804	3,530
Massachusetts	W	150	27	W	51	W	--	--	255	3,210
Michigan	4,520	18,100	3,720	17,400	1,680	7,960	77	946	1,600	7,470
Minnesota	463	2,560	2,030	11,100	1,930	9,710	98	775	2,250	11,100
Mississippi	--	--	--	--	--	--	--	--	--	--
Missouri	2,900	17,500	5,740	43,000	11,500	50,900	2,880	13,200	3,960	19,300
Montana	--	--	W	W	204	653	W	W	11	47
Nebraska	W	W	W	W	814	6,760	185	1,700	655	4,530
Nevada	138	W	562	W	256	951	W	W	W	W
New Jersey	W	W	W	W	W	W	--	--	298	2,200
New Mexico	531	2,120	W	W	W	W	11	W	43	180
New York	1,720	10,200	7,440	51,600	4,360	25,700	319	2,570	7,120	39,900
North Carolina	123	876	W	W	84	448	31	224	254	1,500
Ohio	4,160	18,000	6,750	30,700	21,500	90,800	1,260	6,340	3,780	16,400
Oklahoma	5,610	25,200	4,020	18,500	2,000	8,650	272	1,630	3,970	15,200
Oregon	--	--	--	--	--	--	--	--	--	--
Pennsylvania	3,090	17,400	11,300	64,400	7,250	37,200	719	4,910	8,710	37,600
Rhode Island	--	--	--	--	--	--	--	--	W	W
South Carolina	--	--	--	--	--	--	--	--	--	--
South Dakota	W	W	W	W	W	W	W	W	W	W
Tennessee	5,030	31,600	16,200	102,000	16,100	86,100	1,440	8,460	8,250	47,500
Texas	21,600	98,400	12,000	57,500	21,300	72,500	629	3,440	8,590	27,400
Utah	W	W	W	W	155	522	78	464	65	214
Vermont	21	162	W	W	W	W	W	W	W	W
Virginia	2,430	15,100	3,700	24,000	2,640	13,200	556	3,540	3,650	17,900
Washington	--	--	--	--	W	W	118	572	66	342
West Virginia	635	3,850	1,060	6,120	548	2,850	126	721	933	4,580
Wisconsin	1,510	7,090	1,100	4,960	8,230	34,000	90	582	2,070	8,660
Wyoming	87	634	W	W	4	W	W	W	W	W
Total by use	89,900	469,000	121,000	698,000	154,000	699,000	12,700	73,700	96,300	454,000
Total withheld by use	1,120	8,990	2,000	15,300	772	3,630	188	1,300	1,550	8,450
Grand total	91,000	478,000	123,000	714,000	154,000	702,000	12,900	75,000	97,900	462,000

See footnotes at end of table.

TABLE 15--Continued
CRUSHED LIMESTONE AND DOLOMITE SOLD OR USED BY PRODUCERS
IN 1998, BY STATE AND USE 1/

(Thousand metric tons and thousand dollars)

State	Cement manufacture		Agricultural uses		Lime manufacture		Other uses		Total by State	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Alabama	3,060	26,800	224	1,800	4,360	52,300	20,000	116,000	45,200	298,000
Alaska	--	--	--	--	--	--	W	W	(2/)	(2/)
Arizona	W	W	--	--	W	W	98	534	4,300	23,900
Arkansas	W	W	160	1,130	--	--	1,670	9,070	15,600	72,500
California	11,300	50,800	176	2,950	W	W	10,600	78,900	25,000	150,000
Colorado	W	W	W	W	--	--	W	W	2,470	16,200
Connecticut	--	--	42	425	--	--	W	W	1,520	17,700
Florida	3,440	13,200	818	6,560	--	--	31,700	144,000	79,000	368,000
Georgia	W	W	W	W	--	--	12,100	77,900	17,700	112,000
Hawaii	--	--	W	W	--	--	122	948	357	2,160
Idaho	W	W	44	144	W	W	101	447	1,040	4,030
Illinois	2,510	9,930	2,100	8,940	--	--	32,400	163,000	72,100	371,000
Indiana	3,770	15,000	2,820	12,600	W	W	33,400	153,000	59,700	272,000
Iowa	2,310	W	1,010	3,980	W	W	28,600	155,000	41,800	219,000
Kansas	2,000	7,860	211	1,190	--	--	9,300	43,600	21,200	109,000
Kentucky	W	W	333	1,860	W	W	33,700	155,000	59,500	291,000
Maine	W	W	W	W	W	W	W	W	1,360	8,020
Maryland	2,670	8,820	--	--	--	--	12,100	72,600	18,300	102,000
Massachusetts	--	--	W	W	W	W	1,400	14,100	2,170	21,000
Michigan	6,300	20,800	99	698	W	W	23,800	87,200	43,700	167,000
Minnesota	--	--	275	1,230	4	24	3,690	18,100	10,700	54,700
Mississippi	778	2,710	W	W	--	--	W	W	789	2,710
Missouri	7,080	28,600	1,120	5,600	2,900	29,100	29,000	141,000	67,100	348,000
Montana	W	W	23	W	W	W	621	2,050	3,370	13,200
Nebraska	W	W	656	5,190	--	--	2,490	16,400	7,490	49,800
Nevada	W	W	63	2,050	W	W	784	5,680	5,050	23,100
New Jersey	--	--	81	1,270	2	10	W	W	1,110	7,670
New Mexico	W	W	--	--	--	--	813	3,580	2,200	8,630
New York	W	W	199	1,730	--	--	13,300	73,700	37,700	219,000
North Carolina	--	--	5	25	--	--	W	W	6,590	43,500
Ohio	W	W	1,020	4,520	--	--	34,100	169,000	74,000	343,000
Oklahoma	1,830	8,940	57	221	--	--	11,300	36,400	29,100	115,000
Oregon	W	W	--	--	--	--	W	W	(2/)	(2/)
Pennsylvania	6,910	32,500	395	2,300	W	W	33,000	187,000	71,800	386,000
Rhode Island	--	--	W	W	--	--	W	W	(2/)	(2/)
South Carolina	--	--	--	--	--	--	3,660	26,200	3,660	26,200
South Dakota	1,200	W	--	--	W	W	W	W	2,920	12,100
Tennessee	W	W	432	3,150	W	W	13,900	74,300	63,000	367,000
Texas	10,300	35,900	420	2,930	W	W	17,200	69,100	93,000	372,000
Utah	W	W	9	202	W	W	3,180	14,200	6,350	32,600
Vermont	--	--	--	--	--	--	2,230	9,060	2,640	11,800
Virginia	W	W	609	4,880	W	W	6,360	36,600	22,300	126,000
Washington	119	196	W	W	W	W	1,060	6,390	1,590	8,790
West Virginia	1,170	W	W	W	--	--	7,250	42,000	11,700	64,100
Wisconsin	W	W	378	3,150	W	W	11,200	44,800	24,800	104,000
Wyoming	558	W	--	--	--	--	--	--	1,510	6,980
Total by use	67,300	262,000	13,800	80,800	7,260	81,400	446,000	2,250,000	XX	XX
Total withheld by use	22,900	126,000	64	813	17,000	76,100	9,880	70,500	XX	XX
Grand total	90,200	388,000	13,900	81,600	24,200	158,000	456,000	2,320,000	1,060,000	5,370,000

W Withheld to avoid disclosing company proprietary data; included in "Total withheld by use" and "Total by State." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Withheld to avoid disclosing company proprietary data; included in "Grand total."

TABLE 16
CRUSHED MARBLE SOLD OR USED BY PRODUCERS IN
THE UNITED STATES IN 1998, BY USE 1/

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Coarse aggregate (+1-1/2-inch):		
Riprap and jetty stone	14	151
Filter stone	W	W
Coarse aggregate, graded:		
Bituminous surface-treatment aggregate	45	300
Other graded coarse aggregate 2/	519	4,380
Fine aggregate (-3/8-inch):		
Stone sand, concrete	(3/)	2
Stone sand, bituminous mix or seal	W	W
Screening, undesignated	W	W
Coarse and fine aggregates:		
Graded road base or subbase	389	2,180
Terrazzo and exposed aggregate	39	1,100
Other construction materials 4/	425	3,110
Agricultural, other agricultural uses	W	W
Chemical and metallurgical, lime manufacture	47	1,040
Special:		
Mine dusting or acidic water treatment	W	W
Whiting or whiting substitute	703	38,700
Other fillers or extenders	803	32,300
Unspecified: 5/		
Actual	2,620	16,100
Estimated	2,730	13,200
Total	8,550	115,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes bituminous aggregate (coarse) and concrete aggregate (coarse).

3/ Less than 1/2 unit.

4/ Includes crusher run (select material or fill) and roofing granules.

5/ Includes production reported without a breakdown by end use and estimates for respondents.

TABLE 17
CRUSHED GRANITE AND TRAPROCK SOLD OR USED BY PRODUCERS
IN THE UNITED STATES IN 1998, BY USE 1/

(Thousand metric tons and thousand dollars)

Use	Granite		Traprock	
	Quantity	Value	Quantity	Value
Coarse aggregate (+1-1/2-inch):				
Macadam	W	W	444	2,530
Riprap and jetty stone	3,220	25,600	3,030	21,600
Filter stone	1,140	9,630	1,200	8,430
Other coarse aggregate	2,830	13,300	1,100	8,040
Coarse aggregate, graded:				
Concrete aggregate, coarse	18,900	121,000	6,940	51,200
Bituminous aggregate, coarse	13,300	94,000	5,220	32,300
Bituminous surface-treatment aggregate	2,540	19,700	1,790	16,800
Railroad ballast	9,980	44,200	3,150	17,200
Other graded coarse aggregate	16,500	120,000	5,240	38,400
Fine aggregate (-3/8-inch):				
Stone sand, concrete	3,750	19,400	1,490	13,400
Stone sand, bituminous mix or seal	6,990	40,500	1,460	8,210
Screening, undesignated	5,120	26,300	1,910	11,100
Other fine aggregate	2,220	11,200	768	5,380
Coarse and fine aggregates:				
Graded road base or subbase	20,900	119,000	16,100	95,900
Unpaved road surfacing	1,610	6,330	4,420	20,600
Terrazzo and exposed aggregate	780	4,930	336	1,620
Crusher run or fill or waste	12,600	68,800	5,560	26,200
Other coarse and fine aggregates	3,280	18,400	9,270	53,600
Roofing granules	W	W	1,000	7,530
Other construction materials	379	2,120	1,700 2/	12,100 2/
Other specified uses not listed	88	462	129	1,010
Agricultural:				
Poultry grit and mineral food	W	W	--	--
Other agricultural uses	--	--	25	84
Unspecified: 3/				
Actual	94,700	593,000	21,400	143,000
Estimated	16,500	91,700	14,800	82,300
Total	240,000	1,460,000	108,000	678,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes drain fields.

3/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 18
CRUSHED SANDSTONE AND QUARTZITE SOLD OR USED BY PRODUCERS IN THE
UNITED STATES IN 1998, BY USE 1/

(Thousand metric tons and thousand dollars)

Use	Sandstone		Quartzite	
	Quantity	Value	Quantity	Value
Coarse aggregate (+1-1/2-inch):				
Macadam	W	W	41	248
Riprap and jetty stone	574	5,260	93	775
Filter stone	120	723	82	462
Other coarse aggregate	230	947	144	722
Coarse aggregate, graded:				
Concrete aggregate, coarse	916	4,980	322	2,340
Bituminous aggregate, coarse	1,410	12,400	726	5,950
Bituminous surface-treatment aggregate	249	1,470	95	914
Railroad ballast	80	374	268	1,990
Other graded coarse aggregate	591	6,040	1,350	8,070
Fine aggregate (-3/8-inch):				
Stone sand, concrete	369	2,580	—	—
Stone sand, bituminous mix or seal	285	1,650	295	2,010
Screening, undesignated	302	1,470	351	2,460
Other fine aggregate	500	2,740	171	680
Coarse and fine aggregates:				
Graded road base or subbase	3,550	20,600	900	5,440
Unpaved road surfaces	385	1,800	81	497
Terrazzo and exposed aggregate	150	1,130	66	765
Crusher run or fill or waste	651	2,520	335	1,410
Roofing granules	W	W	—	—
Other coarse and fine aggregates	714	5,280	1,080	6,070
Other construction materials	157	1,270	295	989
Agricultural, poultry grit and mineral food	—	—	W	W
Chemical and metallurgical:				
Cement manufacture	429	1,700	278	1,720
Flux stone	W	W	W	W
Glass manufacture	W	W	—	—
Special:				
Other fillers or extenders	W	W	—	—
Other specified uses not listed	W	W	W	W
Unspecified: 2/				
Actual	9,360	47,700	2,720	13,500
Estimated	7,370	39,600	858	3,980
Total	29,000	171,000	10,700	63,400

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes production reported without breakdown by end use and estimates for nonrespondents.

TABLE 19
CRUSHED VOLCANIC CINDER AND SCORIA AND CRUSHED MISCELLANEOUS STONE
SOLD OR USED BY PRODUCERS IN THE UNITED STATES IN 1998, BY USE 1/

(Thousand metric tons and thousand dollars)

Use	Volcanic cinder and scoria		Miscellaneous stone 2/	
	Quantity	Value	Quantity	Value
Coarse aggregate (+1-1/2-inch):				
Riprap and jetty stone	9	55	264	1,470
Filter stone	27	161	15	113
Other coarse aggregate	--	--	137	835
Course aggregate, graded:				
Concrete aggregate, coarse	138	722	946	7,130
Bituminous aggregate, coarse	W	W	1,700	9,200
Bituminous surface-treatment aggregate	--	--	715	3,310
Railroad ballast	--	--	W	W
Other graded coarse aggregate	64	250	167	1,470
Fine aggregate (-3/8-inch):				
Stone sand, concrete	31	337	79	980
Stone sand, bituminous mix or seal	--	--	645	3,380
Screening, undesignated	67	262	127	882
Other fine aggregate	--	--	W	W
Coarse and fine aggregates:				
Graded road base or subbase	207	943	2,640	11,400
Unpaved road surfacing	W	W	610	2,930
Terrazzo and exposed aggregate	218	1,270	6	71
Crusher run or fill or waste	5	20	458	2,690
Roofing granules	W	W	W	W
Other coarse and fine aggregates	--	--	1,220	4,530
Other construction materials	140	615	1,860	10,500
Agricultural:				
Poultry grit and mineral food	--	--	W	W
Other agricultural uses	--	--	80	571
Chemical and metallurgical, cement manufacture	--	--	3,770	15,400
Special, other fillers or extenders	--	--	W	W
Other miscellaneous uses:				
Light weight aggregate (slate)	--	--	W	W
Flour (slate)	--	--	W	W
Other specified uses not listed	188	2,880	417 3/	2,920 3/
Unspecified: 4/				
Actual	876	5,390	13,700	77,400
Estimated	491	2,660	15,800	80,900
Total	2,510	15,800	47,000	248,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes calcareous marl, shell, and slate.

3/ Includes abrasives and drain fields.

4/ Includes production reported without a breakdown by end use and estimates for nonrespondents.

TABLE 20
RECYCLED ASPHALT AND CONCRETE SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY REGION 1/

Region/Division	Recycled asphalt						Recycled concrete					
	1997			1998			1997			1998		
	Quantity (thousand metric tons)	Value (thousands)	Unit value	Quantity (thousand metric tons)	Value (thousands)	Unit value	Quantity (thousand metric tons)	Value (thousands)	Unit value	Quantity (thousand metric tons)	Value (thousands)	Unit value
Northeast:												
New England	758	\$3,640	\$4.81	388	\$1,850	\$4.76	52	\$321	\$6.17	23	\$115	\$5.00
Middle Atlantic	387	2,570	6.63	182	1,260	6.95	141 r/	759	5.38 r/	173	906	5.24
Midwest:												
East North Central	245	146	0.60 r/	86	329	3.83	17 r/	46	2.71 r/	539	2,350	4.36
West North Central	10	47	4.70	201	943	4.69	128	475	3.71	83	342	4.12
South:												
South Atlantic	W	W	7.00	W	W	W	201 r/	1,280 r/	6.35 r/	329	2,170	6.58
East South Central	—	—	—	—	—	—	W	W	W	W	W	W
West South Central	W	W	5.86	W	W	W	—	—	—	—	—	—
West:												
Mountain	2 r/	11	5.50 r/	2	7	3.50	W	W	W	W	W	W
Pacific	80	806	10.08	352	1,890	5.37	101	1,020	10.11	396	2,350	5.92
Total 2/	1,730	9,090	5.25	1,390	7,290	5.23	649 r/	3,930 r/	6.06 r/	1,590	8,420	5.30

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Includes volcanic cinder and scoria.

2/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 21
RECYCLED ASPHALT SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY STATE 1/

State	1997			1998		
	Quantity (thousand metric tons)	Value (thousands)	Unit value	Quantity (thousand metric tons)	Value (thousands)	Unit value
Alabama	--	--	--	W	W	\$3.26
Alaska	19	\$166	\$8.74	3	\$38	12.67
Arizona	(2/)	(2/)	(2/)	--	--	--
California	55 r/	382 r/	6.95 r/	319	1,740	5.44
Connecticut	--	--	--	W	W	5.00
Florida	--	--	--	W	W	6.67
Hawaii	--	--	--	W	W	4.53
Idaho	2	11	5.50	1	6	6.00
Illinois	18	73	4.06	24	98	4.08
Iowa	--	--	--	1	6	6.00
Kansas	--	--	--	W	W	6.04
Louisiana	--	--	--	W	W	11.11
Maine	53	384	7.25	115	677	5.89
Maryland	W	W	1.00	--	--	--
Massachusetts	623	2,900	4.65	182	643	3.53
Michigan	7	16	2.29	--	--	--
Minnesota	6	29	4.83	W	W	5.00
Missouri	--	--	--	W	W	4.46
Montana	--	--	--	W	W	1.00
New Hampshire	W	W	4.45	28	161	5.75
New Jersey	W	W	6.63	67	357	5.33
New York	40	131	3.28	W	W	15.97
Ohio	W	W	2.80	W	W	3.50
Oregon	--	--	--	W	W	1.60
Pennsylvania	110	866	7.87	76	300	3.95
Rhode Island	--	--	--	W	W	5.56
South Dakota	W	W	4.50	W	W	4.41
Tennessee	--	--	--	18	100	5.56
Texas	W	W	6.55	W	W	3.31
Vermont	--	--	--	W	W	7.00
Washington	W	W	5.09	9	40	4.44
Wisconsin	214	43	2.01	60	224	3.73
Total 3/	1,730	9,090	5.25	1,390	7,290	5.23

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Includes volcanic cinder and scoria.

2/ Revised to zero.

3/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 22
RECYCLED CONCRETE SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY STATE 1/ 2/

State	1997			1998		
	Quantity (thousand metric tons)	Value (thousands)	Unit value	Quantity (thousand metric tons)	Value (thousands)	Unit value
Alabama	W	W	\$5.51	W	W	\$4.10
Alaska	9	\$65	7.22	1	\$6	6.00
California	84	641	7.63	378	2,260	5.97
Connecticut	--	--	--	W	W	5.00
Georgia	W	W	8.73	W	W	9.66
Hawaii	--	--	--	W	W	5.00
Idaho	W	W	5.52	--	--	--
Illinois	3	14	4.67	W	W	5.59
Indiana	W	W	2.00	W	W	3.82
Kansas	--	--	--	W	W	5.86
Maine	W	W	4.90	W	W	4.00
Maryland	W	W	5.56	--	--	--
Massachusetts	41	269	6.56	W	W	5.50
Minnesota	W	W	3.71	W	W	3.93
Mississippi	--	--	--	W	W	12.00
New Hampshire	W	W	4.00	1	6	6.00
New Jersey	W	W	6.90	W	W	4.38
New Mexico	W	W	4.00	W	W	4.17
New York	W	W	4.55	W	W	5.27
North Carolina	11	72	6.55	--	--	--
Ohio	1	4	4.00	2	4	2.00
Oregon	--	--	--	W	W	3.00
Pennsylvania	34	195	5.74	9	62	6.89
South Dakota	--	--	--	W	W	4.60
Virginia	W	W	5.99	226	1,160	5.14
Washington	W	W	4.00	W	W	4.00
Wisconsin	W	W	2.22	289	979	3.39
Total	649 r/	3,930 r/	6.06 r/	1,590	8,420	5.30

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Includes volcanic cinder and scoria.

2/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 23
CRUSHED STONE SOLD OR USED BY PRODUCERS IN THE UNITED STATES IN 1998,
BY REGION AND METHOD OF TRANSPORTATION 1/

(Thousand metric tons)

Region/Division	Truck	Rail	Water	Other	Not transported	Not specified	Total
Northeast:							
New England	8,920	1,640	--	--	3,020	23,000	36,600
Middle Atlantic	77,900	2,560	W	3,330	11,400	68,700	165,000
Midwest:							
East North Central	118,000	4,730	26,500	W	8,470	126,000	285,000
West North Central	63,900	2,380	8,000	1,920	4,660	78,000	159,000
South:							
South Atlantic	155,000	10,300	4,260	2,140	15,800	173,000	360,000
East South Central	87,000	2,280	2,160	937	12,500	69,300	174,000
West South Central	77,400	24,200	W	4,250	6,480	55,700	173,000
West:							
Mountain	20,000	1,690	--	W	5,150	24,100	52,800
Pacific	37,300	3,430	1,760	6,010	7,610	48,600	105,000
Total	645,000	53,200	49,000	21,300	75,000	667,000	1,510,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 24
NUMBER OF CRUSHED AND BROKEN STONE OPERATIONS AND PROCESSING PLANTS IN THE
UNITED STATES IN 1998, BY STATE 1/

State	Mining operations on land				Dredging operations	Total active operations
	Stationary	Portable	Stationary and portable	No. plants or unspecified		
Alabama	55	3	1	7	--	66
Alaska 2/	2	10	2	2	--	16
Arizona	17	23	1	6	--	47
Arkansas	35	16	5	5	--	61
California	73	30	15	13	1	132
Colorado	14	6	6	4	--	30
Connecticut	18	2	1	--	--	21
Florida	56	21	7	11	2	97
Georgia	85	3	3	3	--	94
Hawaii	13	10	5	3	--	31
Idaho	9	30	4	4	--	47
Illinois	86	39	13	9	--	147
Indiana	77	2	6	11	--	96
Iowa	33	177	2	5	--	217
Kansas	24	80	4	1	--	109
Kentucky	78	6	7	2	--	93
Louisiana	--	--	--	1	--	1
Maine	8	9	--	--	--	17
Maryland	23	5	--	1	1	30
Massachusetts	25	6	2	3	--	36
Michigan	18	8	2	4	--	32
Minnesota	8	26	1	5	--	40
Mississippi	2	1	1	--	--	4
Missouri	98	90	11	5	--	204
Montana	11	8	--	2	--	21
Nebraska	6	2	3	--	--	11
Nevada	12	3	1	1	--	17
New Hampshire	8	3	1	2	--	14
New Jersey	16	2	8	1	--	27
New Mexico	15	30	2	5	--	52
New York	76	10	15	3	--	104
North Carolina	88	8	4	4	--	104
North Dakota	--	--	--	4	--	4
Ohio	105	13	9	4	1	132
Oklahoma	46	6	7	--	--	59
Oregon	46	94	3	16	2	161
Pennsylvania	149	22	19	19	--	209
Rhode Island	8	1	--	--	--	9
South Carolina	32	--	3	3	--	38
South Dakota	9	2	--	--	--	11
Tennessee	109	7	3	3	--	122
Texas	99	38	11	1	--	149
Utah	11	15	4	2	--	32
Vermont	10	5	2	2	--	19
Virginia	92	4	7	10	--	113
Washington	26	51	11	22	--	110
West Virginia	35	7	5	1	--	48
Wisconsin	30	113	3	12	--	158
Wyoming	5	6	1	2	--	14
Total	1,900	1,050	221	226	7	3,410

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Data derived, in part, from Alaska Division of Geological and Geophysical Surveys information.

TABLE 25
U.S. EXPORTS OF CRUSHED STONE IN 1998, BY DESTINATION 1/

(Metric tons)

Destination	Limestone for cement manufacturing	Other	Chalk, crude	Granules, chippings	Total
North America:					
Bahamas, The	498	--	--	60	558
Barbados	--	--	35	262	297
Bermuda	--	--	--	13	13
British Virgin Islands	27	--	--	--	27
Canada	3,750,000	866	1,500	142,000	3,900,000
Cayman Islands	234	--	--	--	234
Costa Rica	--	--	--	6	6
Dominican Republic	46	--	--	--	46
Honduras	--	--	4	--	4
Jamaica	--	--	7	379	386
Mexico	11,300	27	70	5,240	16,600
Nicaragua	--	--	--	4	4
Panama	20	--	--	--	20
Total	3,760,000	893	1,620	148,000	3,910,000
South America:					
Argentina	--	--	13	576	589
Brazil	13,500	--	35	266	13,800
Chile	708	--	2	4,230	4,940
Colombia	--	--	40	--	40
Ecuador	--	--	193	--	193
Suriname	17,100	--	--	--	17,100
Uruguay	--	--	--	2,090	2,090
Venezuela	750	--	1,140	816	2,710
Total	32,000	--	1,430	7,980	41,400
Europe:					
Austria	800	--	--	3	803
Belgium	83,000	--	--	--	83,000
Czech Republic	4,200	--	--	--	4,200
Denmark	124	--	--	--	124
France	20,800	60	--	5,020	25,900
Germany	52,600	12,200	--	14	64,900
Hungary	1,600	--	--	--	1,600
Iceland	1,640	85	1	--	1,730
Italy	31,200	45	--	776	32,000
Netherlands	--	21	--	4,530	4,550
Poland	2,400	--	--	--	2,400
Spain	--	18	--	--	18
Sweden	3,320	21	--	8	3,350
Switzerland	1,030	--	--	54	1,090
United Kingdom	31,700	574	--	74	32,400
Total	234,000	13,000	1	10,500	258,000
Asia:					
China	5,540	--	--	4,430	9,970
Hong Kong	67	36	7	768	878
Indonesia	--	29	89	--	118
Japan	86,600	1,110	1	39	87,800
Korea, Republic of	1,760	100	--	531	2,390
Malaysia	45	--	--	--	45
Philippines	--	--	--	19	19
Singapore	--	199	41	77	317
Sri Lanka (Ceylon)	--	52	--	--	52
Taiwan	10,400	--	--	3,100	13,500
Vietnam	--	--	16	--	16
Total	104,000	1,520	154	8,970	115,000
Oceania:					
Australia	4,610	4	22	36,400	41,000
New Zealand	5	--	1	--	6
Total	4,610	4	24	36,400	41,000

See footnotes at end of table.

TABLE 25--Continued
U.S. EXPORTS OF CRUSHED STONE IN 1998, BY DESTINATION 1/

(Metric tons)

Destination	Limestone for cement manufacturing	Other	Chalk, crude	Granules, chippings	Total
Middle East:					
Israel	--	57	--	--	57
Qatar	--	--	--	17	17
Saudi Arabia	--	--	--	1,950	1,950
United Arab Emirates	--	--	--	14	14
Total	--	57	--	1,980	2,040
Africa:					
Egypt	--	--	1	--	1
Uganda	--	--	--	181	181
Total	--	--	1	181	182
Grand total	4,140,000	15,500	3,220	214,000	4,370,000
Total value thousands	\$17,700	\$7,370	\$2	\$16,400	\$41,500

1/ Data are rounded to three significant digits; may not add to totals shown.

Source: Bureau of the Census.

TABLE 26
U.S. IMPORTS OF CRUSHED STONE AND CALCIUM CARBONATE FINES, BY TYPE 1/

(Thousand metric tons and thousand dollars)

Type	1997			1998		
	Quantity	C.i.f. value	Unit price	Quantity	C.i.f. value	Unit price
Crushed stone and chips:						
Limestone	7,840	61,400	\$8.00	8,260	66,700	\$8.00
Limestone for flux or cement manufacturing	3,720	32,200	9.00	3,970	34,400	9.00
Quartzite	(2/)	253	1,004	(2/)	305	1,120
Other	865	9,740	11	1,400	13,400	10.00
Total	12,400	104,000	XX	13,600	115,000	XX
Calcium carbonate fines: 3/						
Natural chalk	(2/)	770	XX	(2/)	312	XX
Calcium carbonates other chalk	4	1,150	298.00	3	1,040	382.00
Total	4	1,920	XX	3	1,360	XX
Grand total	12,400	106,000	XX	13,600	116,000	XX

XX Not applicable.

1/ Data are rounded to three significant digits, except prices; may not add to totals shown.

2/ Less than 1/2 unit.

3/ Excludes precipitated calcium carbonates.

Source: Bureau of the Census.

FIGURE 1
PRODUCTION OF CRUSHED STONE IN THE UNITED STATES IN 1998, BY GEOGRAPHIC DIVISION

