

**Lee County Board Of County Commissioners  
Agenda Item Summary**

Blue Sheet No. 20060186

**1. ACTION REQUESTED/PURPOSE:** Direct an amendment to Lee County Land Development Code (LDC) Chapter 3 pertaining to development blasting to public hearing as follows:

LPA: March 27, 2006

1<sup>st</sup> Public Hearing: March 28, 2006 at 5:05 p.m.

2<sup>nd</sup> Public Hearing: April 11, 2006 at 5:05 p.m.

**2. WHAT ACTION ACCOMPLISHES:** Satisfies the statutory requirement to hold two public hearings to amend the LDC. If adopted, the proposed ordinance will serve to incorporate the recommendations of the Blasting Consultant and the Blasting Ad Hoc Committee into the LDC.

**3. MANAGEMENT RECOMMENDATION:**

<b>4. Departmental Category:</b> 12 <b>C 12 A</b>		<b>5. Meeting Date:</b> <b>03-14-2006</b>
<b>6. Agenda:</b> <input checked="" type="checkbox"/> Consent <input type="checkbox"/> Administrative <input type="checkbox"/> Appeals <input type="checkbox"/> Public <input type="checkbox"/> Walk-On	<b>7. Requirement/Purpose: (specify)</b>	
	<input checked="" type="checkbox"/> Statute	125.66
	<input type="checkbox"/> Ordinance	
	<input type="checkbox"/> Admin. Code	
	<input type="checkbox"/> Other	
		<b>8. Request Initiated:</b> Commissioner _____ Department <u>County Attorney</u> Division _____ By: <i>[Signature]</i> <b>Dawn E. Perry-Lehnert</b> Assistant County Attorney

9. Background: In April 2004, the Board adopted LDC Chapter 3 (LCO 04-04) establishing development blasting regulations for unincorporated Lee County. Subsequent to the adoption of this ordinance, and at the suggestion of the development community, the Board approved a Blasting Study for Lee County. The stated purpose of the study was to analyze the aspects of development blasting in unincorporated Lee County, evaluate alternative methods to blasting, determine options to reduce or eliminate blasting impacts, including those related to adverse human impacts, and, consider use of state of the art blasting techniques.

The final Blasting Study report was delivered to Lee County in December 2005. A copy of the executive summary is attached. The full report may be reviewed at Lee Cares.

(continued on page 2)

**10. Review for Scheduling:**

Department Director	Purchasing or Contracts	Human Resources	Other	County Attorney	Budget Services				County Manager/P.W. Director
					Analyst	Risk	Grants	Mgr.	
				<i>[Signature]</i>	FK 2/23	55 2/23/06	2/23/06	2/23/06	HS 2/23/06

**11. Commission Action:**

- Approved
- Deferred
- Denied
- Other

ATTN  
 Ce Admin  
 3/14/06

RECEIVED BY  
 COUNTY ADMIN: *[Signature]*  
 2-23-06  
 8:40  
 COUNTY ADMIN  
 FORWARDED TO: *[Signature]*  
 2/23/06  
 SPM

**Blue Sheet #:** 20060186  
**Page #:** 2  
**Subject:** LDC Chapter 3 Amendment – 2006 Blasting Ordinance

A reading of the Blasting Study report indicates that the 0.3 PPV adopted by the Board in 2004 is appropriate in Lee County. The Blasting Study indicates that this blasting level affords an effective, though not the most cost efficient, means of excavating rock layers to create development infrastructure while providing a reasonable level of protection for surrounding structures and property owners.

The Blasting Consultant also proposed a number of amendments to the existing regulations. These recommendations are reflected in the attached proposed ordinance.

The Blasting Ad Hoc Committee also proposed a number of recommended amendments, which are included in the proposed ordinance.

Review of the proposed ordinance is scheduled before EROC on March 8, 2006 and LDCAC on March 10, 2006.

County staff has reviewed the proposed ordinance and recommends adoption after the Board selects between the various alternative provisions outlined in the draft ordinance.

Attachments:

1. Draft Proposed Ordinance
2. Blasting Study Executive Summary

cc: Mary Gibbs, Director, DCD  
Pam Houck, Director, Zoning Division  
Paul O'Connor, Director, Planning Division  
Robert Stewart, Building Official, DCD  
Rick Roberts, Chief Code Enforcement Officer  
Nettie Richardson, Senior Planner, DCD  
Mick Ostrowski, Code Enforcement Officer

ORDINANCE NO. 06-

AN ORDINANCE AMENDING THE LEE COUNTY, FLORIDA, LAND DEVELOPMENT CODE CHAPTER 3, EXPLOSIVES AND BLASTING REGULATIONS PERTAINING TO DEVELOPMENT BLASTING; AMENDING APPLICABILITY; WINKLER ROAD EXTENSION BLASTING PROHIBITION (LDC §3-2); PROVIDING DEFINITIONS FOR ACCELERATION, AMPLITUDE, BLAST SITE, DISPLACEMENT, HABITABLE STRUCTURE, INFRASTRUCTURE STRUCTURE, PEAK VECTOR SUM, VELOCITY AND WAVELENGTH; AMENDING DEFINITIONS OF FREQUENCY PEAK PARTICLE VELOCITY AND STRUCTURE (LDC §3-3); AMENDING; BLASTING PERMIT APPLICATION REQUIREMENTS (LDC §3-5); BONDS AND ESCROW AGREEMENTS (LDC §3-7); LIMITATIONS ON BLASTING INTENSITY (LDC §3-8); LIMITATION ON BLASTING ACTIVITY (LDC §3-9); BLASTING PERMIT ISSUANCE; STANDARD PERMIT CONDITIONS (LDC §3-10); RECORD KEEPING (LDC §3-13); BLAST VIBRATION MONITORING (LDC §3-15); PRE- AND POST-BLAST CONDITION SURVEYS (LDC §3-16); VIOLATIONS AND PENALTIES (LDC §3-20); PROVIDING FOR CONFLICTS OF LAW; SEVERABILITY; CODIFICATION AND SCRIVENER'S ERRORS; AND AN EFFECTIVE DATE.

WHEREAS, pursuant to Article VIII, Section 1 of the Florida Constitution and Chapter 125 of the Florida Statutes, Lee County is authorized and required to protect the public health, safety and welfare of its citizens and has the power and authority to enact regulations for valid governmental purposes that are not inconsistent with general or special law; and

WHEREAS, Florida Statutes Sections 125.01(1)(h) and (t) authorize counties to establish, coordinate, and enforce regulations necessary for the protection of the public; and

WHEREAS, the Board adopted Lee County Land Development Code (LDC) Chapter 3 establishing regulations applicable to development blasting in Lee County on April 27, 2004; and

WHEREAS, the Board hired a consultant to study the various issues and aspects of development blasting in order to determine if appropriate levels of blasting intensity can be established for Lee County given its geology and development characteristics; and

WHEREAS, the Blasting study was completed in 2005 and the recommendations of the consultant have been considered by County staff and the Blasting Ad Hoc Committee; and

WHEREAS, the Blasting Study includes a number of proposed amendments to the LDC blasting and explosives regulations; and

WHEREAS, Lee County Comprehensive Plan Policy 5.1.5 provides protection for future and existing residential uses from the encroachment of uses that are destructive to the character and integrity of the residential environment; and

WHEREAS, Goal 24 of the Lee County Comprehensive Land Use Plan (Lee Plan) mandates that the County maintain clear, concise, and enforceable development regulations that fully address on-site and off-site development impacts, yet function in a streamlined manner; and

WHEREAS, the Board of County Commissioners adopted the Lee County Land Development Code, which contains a comprehensive compilation of regulations applicable to the development of land in Lee County; and

WHEREAS, the Blasting Ad Hoc Committee has reviewed the Blasting study and the proposed amendments to Chapter 3; and

WHEREAS, the Land Development Code Advisory Committee was created by the Board of County Commissioners to explore amendments to the Land Development Code; and

WHEREAS, the Land Development Code Advisory Committee has reviewed the proposed amendments to blasting regulations and recommends adoption; and

WHEREAS, the Executive Regulatory Oversight Committee reviewed the proposed amendments to the Code and recommended their adoption; and

WHEREAS, the Local Planning Agency reviewed the proposed amendments on \_\_\_\_\_ and found them consistent with the Lee Plan; and

WHEREAS, the provisions and regulations hereinafter contained and enacted are for the purpose of securing and promoting the public health, safety and welfare of the inhabitants and property of Lee County.

NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF LEE COUNTY, FLORIDA:

**SECTION THREE: AMENDMENT TO LDC CHAPTER 3.**

Lee County Land Development Code Chapter 3 is hereby amended as follows with strike through identifying deleted provisions and underline identifying additional provisions.

**Chapter 3**

**EXPLOSIVES AND BLASTING REGULATIONS**

**ARTICLE I**

**DEVELOPMENT BLASTING**

**Sec. 3-2. Applicability; Winkler Road extension blasting prohibition.**

- (a) No change.
- (b) No change.

*[NOTE: The study proposes the elimination of the Moratorium applicable to Winkler Road Extension. The Winkler residents have a strong preference for maintaining the blasting prohibition in this area.]*

*Based upon the study results, there is no substantive evidence to support retaining the moratorium/prohibition. Consequently, the prohibition is no longer legally defensible.*

(c) Development blasting activity is prohibited within the Winkler Road Extension area described as follows:

That land within the Suburban and Outlying Suburban Land Use Categories as defined in the Lee County Comprehensive Plan, lying south of Summerlin Road within Sections 34 and 35, Township 45 South, Range 24 East and Sections 2, 3, 4, 9, 10 and 11, Township 46 South, Range 24 East and west of Hendry Creek.

**Sec. 3-3. Definitions.**

The following words, terms and phrases will have the meanings stated in this section.

*Acceleration* means the velocity per unit time.

*Amplitude* means a time varying or kinematic vibration quantity of displacement,

velocity, or acceleration. These all have instantaneous values at any moment and also peak values at a specific moment for any vibration record.

*Blast site* means the limits or boundary of the excavation area that will be subject to the blasting activity. For example, the boundary of a proposed lake within the development seeking a development blasting permit.

*Displacement* means the amount of deviation or distance of any particle or point from its rest position.

*Frequency* means the ~~blast energy over time~~ number of cycles per unit time. In vibration analysis, unit time is a second. Frequency is the number of time the particles (see Peak Particle Velocity) move back and forth in one second. This back and forth motion can also be referred to as oscillations. The number of oscillations/second or cycles/second that a particle makes under the influence from the vibration is measured in hertz.

*Habitable structure* means a building, existing or under construction, or related facility that can be inhabited or occupied by one or more persons. It includes, but is not limited to, homes, mobile homes, commercial enterprises and buildings, offices, hospitals, public service buildings (ie fire station), and other structures that may be occupied by a person; and, the accessory structures associated with the building such as pools, wells, garages, foundations, docks, seawalls, driveways, concrete slabs and other similar structures within a 100 foot circumference around a habitable structure.

*Infrastructure structure* means a facility or structure, existing or under construction, that is used to support use of habitable structure or community growth. It includes roadways, water and sewer lines, utility poles, equipment boxes, pump stations, drainage facilities, water management facilities, bridges, tunnels, and other similar infrastructure related facilities and structures.

*Peak particle velocity (PPV)* means a measurement of ground vibration velocity in the displacement per unit time in reference to the speed or excitation of the particles in the ground resulting from vibratory motion. In blasting, ground particles oscillate in response to a vibration wave. This oscillation is measured in particle velocity. The maximum rate is Peak Particle Velocity (PPV). This is measured in inches per second or millimeters per second. Peak Particle velocity is the maximum rate of particle movement.

*Peak Vector Sum or Resultant Peak Particle Velocity* means the sum of the three peaks in a vibration wave. This sum is not the same as the Peak Particle Velocity and is not the appropriate measure under this code.

*Structure* means a building or facility that is existing or under construction. It includes, ~~but is not limited to, homes, mobile homes, buildings, roadways, utilities,~~

~~foundations, pools, wells, drainage facilities, water management facilities, seawalls, docks, driveways, concrete slabs and similar improvements both infrastructure structures and habitable structures.~~

Velocity means displacement per unit time. Rate of change or displacement, or how fast a particle moves from its rest position to its maximum displacement position and back.

Wavelength means one complete cycle.

*No change to the balance of this section.*

### **Sec. 3-5. Blasting permit application requirements.**

(a) *Application.* Only a locally registered user may apply for a blasting permit. The application must include the following:

- (1) Name, address and contact information for the following individuals:
  - a. User (the permit applicant);
  - b. Blaster;
  - c. Developer;
  - d. Property owner;
  - e. Engineer creating or corroborating the blasting plan;
  - f. Seismograph operator; and
  - g. Person to conduct pre- and post-blast surveys.
- (2) Local registrations for the user and blaster responsible for proposed activity.
- (3) Location of proposed blasting activity. (Include Strap number, physical address, metes and bounds legal description with accompanying sketch, and an aerial depicting project site.)
- (4) A description of the project to be benefitted by the blasting activity, including a copy of the approved local development order, and an explanation of why the blasting is necessary.
- (5) A sketch of the proposed blasting site/project superimposed over an aerial, showing measured distances from all structures, buildings, streets, above and below ground utilities, wells and other facilities within ~~1,500~~ 1000 feet of the blasting site.
- (6) A list of all property not under the ownership or control of the user, blaster or developer within ~~3,000~~ 2,000 feet of the blast site. This list must include the name and address of the property owner, whether the property is improved,

and the type of structure and occupancy.

- (7) A proposed blasting plan that includes:
  - a. description of proposed blasting procedure;
  - b. an estimate of the total number of cubic yards to be removed as a result of the blasting;
  - c. an estimate of the number of blasts to be detonated;
  - d. the quantity and type of explosives to be used;
  - e. maximum amount of explosives per delay;
  - f. maximum number of holes per delay;
  - g. proposed delay between holes and rows; and
  - h. proposed placement of seismographic machines.
- (8) Estimated starting date and completion date for blasting operations.
- (9) Hours of intended blasting operations.
- (10) Traffic control, barricading and sign plan.
- (11) Warning notification plan.
- (12) Letter of permission and authorization, signed by the property owner and acknowledged before a notary, allowing the proposed blasting activity.
- (13) Written approval, or letters of no objection, from the Lee County Department of Transportation, Lee County Port Authority, Lee County Utilities, and the utility entities holding franchise rights within ~~3,000~~ 2,000 feet of the proposed blasting site. The approval letter may impose conditions on the blasting activity that are intended to preserve and protect structures for which the entity is responsible.
- (14) Other information deemed necessary or appropriate by the Director or Board, which may include, but is not limited to:
  - a. pre-blast assessment, prepared by a geotechnical engineer or other blasting professional, which assesses the geology of the blast site and surrounding area out to ~~3,000~~ 2,000 feet and the potential for damage to structures and facilities within ~~3,000~~ 2,000 feet of the blast site;
  - b. pre-blast inspection of structures and facilities located near the proposed blast location. (Including video taping of structures);
  - c. bond to protect County facilities;
  - d. hydrological study;



- e. geological study; and
- f. test wells.

(b) *Fees.* The established fee for blasting permit applications and blasting inspections are set forth in the Lee County Administrative Code.

(c) *Escrow Agreement.* Prior to issuance of the blasting permit, the applicant must deliver an executed escrow agreement, acceptable to the County Attorney's office, and fully funded with cash in the amount of \$50,000.

### **Sec. 3-7. Bonds and escrow agreements.**

Bonds required as a condition of permit approval must be in a form prescribed by the County and found legally sufficient by the County Attorney's office.

Escrow agreements must be executed on the form required by Lee County and funded with cash. Prior to issuance of a blasting permit, the escrow agreement must be reviewed and approved by the County Attorney's office. In all instances the County will act as the escrow agent. Funds will be disbursed from the escrow account in accord with the terms of the agreement and section 3-19.

The sole purpose of this escrow agreement is to compensate property owners for damage (cosmetic or structural) to their property resulting from the blasting activity. To ensure sufficient funds will be available for payment, the bond must include a provision for replenishment to maintain the minimum \$50,000 balance.

Disbursements from the escrow account will be made by the County based upon the decision of the arbiter as a result of binding arbitration proceedings. The developer is solely responsible for the costs associated with the arbitration proceedings.

### **Sec. 3-8. Limitations on blasting intensity.**

(a) Blast intensity will be measured in all four compass directions at the nearest structure not owned by the Developer, as measured from the boundary of the blast site. If no structure exists within one mile of the blast site, then the measurement will be taken at the one mile mark in the direction of the nearest structure or at an alternative location specifically identified by the approved blasting permit. However, Subsequent to the issuance of the blasting permit, the Director has the discretion to require monitoring of intensity levels at alternate locations not under the ownership or control of the developer, user or blaster if such is warranted based upon complaints received by the County after the blasting activity begins. These alternate locations may be inside or outside the overall development project boundary.

(b) Blast intensity may not exceed any of the following limits:

Peak Particle Velocity (PPV):

Calculating PPV using the Peak Vector Sum is prohibited for purposes of compliance with this code.

Habitable Structure 0.30 inches per second

Utility 5.0 inches per second

Bridge 5.0 inches per second

Roadway 10 inches per second for roadway outside the known fracture zone of the blast.

Airblast overpressure: 134 peak dBL (linear) at a habitable structure

~~--0.1 Hz high-pass system~~

~~133 peak dBL (linear) --2 Hz high-pass system~~

~~129 peak dBL (linear) --5 or 6 Hz high-pass system~~

~~(c) **80% Rule.** If the user or blaster, based upon their expertise and experience, have reason to believe that a blast will exceed 80% of one or more of the intensity thresholds set forth above, then blasting activity must cease immediately. Blasting activity will be permitted to resume after the user obtains approval for a modification of the blasting permit that will ensure the blasting intensity does not exceed the intensity limitations set forth in subsection 3-8(b).~~

~~In addition to the above, if the daily shot records submitted for the blasting activity in accordance with this article indicate 80% of one or more intensity limitations set forth above have been exceeded, all blasting activity must cease. Blasting activity will be permitted to resume only after the user obtains approval for a modification of the blasting permit that will ensure the blasting intensity does not exceed the intensity limitations set forth in subsection 3-8(b).~~

### **Sec. 3-9. Limitation on blasting activity.**

#### ***Blasting Study proposal***

Blasting activity proposed within 600 feet of a habitable structure not under the ownership or control of the developer, user or blaster, is prohibited. The 600 feet will be measured from the boundary of the proposed blast site, in accordance with section 3-17. must meet the following additional requirements:

- a. 300 feet or less from habitable structure: the blaster must use rubber tire blasting mats.
- b. 301 to 600 feet from a habitable structure: the blaster must use either rubber tire blasting mats, or provide at least 3 feet of overburden or additional cover (ie sand or dirt).

## ***Ad Hoc Blasting Committee proposal***

Blasting activity proposed within ~~600~~ 300 feet of a habitable structure ~~not under the ownership or control of the developer, user or blaster,~~ is prohibited. The ~~600~~ 300 feet will be measured from the boundary of the proposed blast site, in accordance with section 3-17.

Blasting may occur within 301 to 600 feet from a habitable structure provided the blaster uses either rubber tire blasting mats, or provides at least 5 feet of overburden or additional cover (ie sand or dirt).

~~A limited exception may exist where the only structures within the 600-foot area constitute infrastructure (i.e. roads or utilities) under the ownership and control of a public entity and the public entity specifically states in writing to the Director that it does not object to the proposed blasting. If the public entity does not object to the proposed blasting within 600 feet and the subject structure consists of ductile iron pipe carrying potable water, then the public entity may also waive the 0.3 PPV blast intensity limitation, but only for the subject structure. This waiver must also be in writing to the Director. If this occurs, the Board has the discretion to issue the permit allowing the proposed blasting.~~

### **Sec. 3-10. Blasting permit issuance; Standard permit conditions.**

(a) *Blasting permit required.* It is unlawful to conduct development blasting activity, including test blasting, within the unincorporated area of Lee County without a valid blasting permit issued in accordance with this article.

(b) *Right to permit approval.* Issuance of a blasting permit is a privilege and not a right. ~~Issuance of a permit constitutes a discretionary act of the Board based upon review of the permit application and relevant information available to the Board from County departments and files concerning the user, blaster, developer or owner of the subject project. Denial of a blasting permit application will include a written explanation for the denial. The Board of County Commissioners may prohibit development blasting by imposing a condition in a zoning resolution or otherwise by adopting an ordinance. An applicant's ability to comply with the criteria and conditions set forth in this Chapter does not override the Board's action to prohibit development blasting at a particular location.~~

Blasting permit applications will be reviewed by the Board ~~as a public hearing agenda item. Public hearings will be scheduled for 9:30 or as soon thereafter as they may be heard~~ Director. County staff will prepare a written recommendation, including proposed permit conditions, to accompany the permit application as part of the ~~agenda item backup package provided to the Director for action on the permit application.~~ The conditions set forth in this article will be considered the minimum conditions applicable to blasting permit approval.

As part of the permit review process, the ~~Board~~ Director will consider, at minimum, the compatibility of the proposed blasting activity with the surrounding community, and the proximity of schools, churches, health care facilities and public infrastructure facilities to the blast site. ~~Notwithstanding the above, a~~ A blasting permit ~~will~~ may be denied if the ~~Board determines~~ Director believes approval of the proposed blasting activity is not in the best interest of the public health, safety and welfare of ~~its~~ County citizens. Denial of a blasting permit application will include a written explanation for the denial.

(c) *Permit denial.* The Department of Transportation, Lee County Port Authority, Lee County Utilities, or an entity holding a utility franchise within the area affected by the proposed blasting activity has the right to deny a blasting permit application in order to afford reasonable protection of public infrastructure or facilities. The reason for the denial must be specifically stated in writing.

(d) *Standard conditions.* The following provisions constitute the standard conditions applicable to development blasting permits.

- (1) County staff has the right to enter upon the property and complete all necessary inspections related to the blasting activity or in response to complaints resulting from the blasting activity.
- (2) Hours of blasting activity: 10am-4pm Monday through Friday  
No weekends  
No State holidays  
No Federal holidays
- (3) The permit is issued to the user identified in the application and allows the blaster identified in the application to conduct the blasting activity. If the blaster identified in the application changes subsequent to the application submittal or after the permit is issued, then the user must notify the County as to the name, address, contact information and registration requirements of the replacement blaster prior to detonation of blasts by the replacement blaster.
- (4) The responsible user, blaster and engineer or ~~engineer's designee~~, identified in the permit application, must be onsite during all phases of the physical blast preparation (drilling holes, etc.) and detonation activity.
- (5) No detonation of explosives (blasting) may occur without appropriate County staff on site.
- (6) Notice of the proposed blast time must be provided to Lee County Code Enforcement and the Fire District 24 hours prior to the blast in accordance with section 3-14. A Code Enforcement inspector must be on-site during the

blast.

- (7) A blasting permit is issued to the user and is not transferable.
- (8) A record of each blast must be maintained in accordance with section 3-13.
- (9) A permit is valid for 90 days from date of issuance, unless otherwise specifically stated on the face of the permit. Permit extensions are allowed in accordance with section 3-12.
- (10) Issuance of the blasting permit does not relieve the applicant, the user, the blaster or the developer of responsibility for the results of the blasting activity, including the accuracy and adequacy of the blasting plan as implemented in the field.
- (11) The developer is responsible for handling, discharging or settling all damage or annoyance claims resulting from the blasting activity.
- (12) The developer must execute an escrow agreement and fund a cash escrow account prior to issuance of the blasting permit. The sole purpose of this escrow agreement is to compensate property owners for damage (cosmetic or structural) to their property resulting from the blasting activity. Lee County will be the escrow agent. Disbursements from the escrow account will be made by the County based upon the decision of the arbiter as a result of binding arbitration proceedings. The developer is solely responsible for the costs associated with the arbitration proceedings.

### **Sec. 3-13. Record keeping.**

The permit applicant (user) is responsible to maintain a record of each blast. A copy of the record must be filed with Lee County Code Enforcement, on a Lee County Standard Blast Report Form, no later than 10 a.m. of the workday following the blast. All original blasting records must be retained by the user responsible for the blasting activity for at least three years following the conclusion of the blasting activity. The records must be available for inspection by the County upon request. The blasting records must include the following information:

- (a) Name, address and license number of the user responsible for the blasting activity;
- (b) Name, address and permit number of the blaster conducting the blasting activity;
- (c) Date, time and location of the blast;

- (d) Blast pattern diagram and firing times;
- (~~de~~) Type of material blasted;
- (~~ef~~) Number of holes, spacing, burden;
- (g) Number of wet holes and water depth;
- (~~fh~~) Diameter and depth of holes;
- (~~gi~~) Type of explosives used ~~per hole~~;
- (~~hj~~) Amount of explosives used;
- (~~ik~~) Maximum amount of explosives/pounds per delay;
- (~~jl~~) Maximum number of holes per delay;
- (~~km~~) Method of firing and type of circuit;
- (~~ln~~) Weather conditions (including factors such as wind direction, temperature, cloud cover etc);
- (~~mo~~) Height or length of stemming;
- (p) Type of stemming used;
- (~~nq~~) Whether mats or other types of protection were used; type of mats used;
- (~~or~~) Type of detonators used ~~and delay periods used~~ (ie electronic or non-electronic);
- (s) Number of detonators used;
- (t) Number of primers used;
- (u) Number of holes decked; deck separation; weight of explosives per deck; depth of decking;
- (~~pv~~) Location of each seismograph; set up procedure used;
- (~~qw~~) The PPV, airblast overpressure and frequency measurements for the blast;

- (x) Global position system direction and distance in feet to the nearest building in each compass direction;
- (ry) Copy of strip tape from seismograph showing readings, marked with date, time and machine location, and signed by seismograph operator.
- (z) Type and make of blasting machine; and
- (aa) Development blasting permit number.

### **Sec. 3-15. Blast vibration monitoring.**

All blasts must be monitored using seismograph equipment that meets the criteria and requirements of this section. The purpose of the seismographic readings are to confirm compliance with the provisions of this article.

(a) *Seismograph equipment.* The instrumentation used must meet the following minimum criteria.

- (1) Capable of measuring the three mutually perpendicular components of particle velocity in directions vertical, radial and perpendicular to the vibration source. The equipment must be capable of measuring a frequency response of 2 Hz to 200 Hz, with no greater than a 3dB roll off, and PPV of up to at least 4 10 inches per second; and have an airblast channel frequency range of .1 to 200 Hz, 2 to 200 Hz, 5 or 6 to 200 Hz.
- (2) Capable of recording the full wave form from a single blast as well as continuous monitoring.
- (3) Capable of providing a contemporaneous printed hard copy (strip chart) of the full wave form and PPV data in the field as well as recording digital data as a permanent record. Instruments limited to recording seismic activity at a remote location for later retrieval and dissemination may not be used to meet LDC requirements, they will be considered supplemental only.
- (4) Each piece of the monitoring equipment must be labeled with a serial number. This serial number must be cross referenced or otherwise identified on the field print out copy as well as the permanent digital record.
- (5) Components of the monitoring equipment must be calibrated as a unit and remain together as a unit for the duration of the permitted blasting activity. Mixing various pieces together that were not calibrated for use as a unit will not satisfy the requirements of this section.

(6) Monitoring equipment must be calibrated at least once every 6 months or in accordance with the manufacturer's written instructions and recommendations. Written documentation as to the calibration, including identification of the unit parts, who performed the calibration and the standard used, must accompany the instruments and be available for immediate inspection upon request by the County.

(b) *Set up of seismograph equipment.*

(1) Set up of the equipment must be in accordance with accepted industry standards as identified by the International Society of Explosive Engineers or the US Department of Interior, Bureau of Mines Report RI 8508.

(2) Seismograph equipment must be set up at the locations approved as part of the blasting plan.

(3) Whenever possible, monitoring equipment must be placed in undisturbed soil. Placement on driveways, walkways or slabs must be avoided.

(4) The Board Director or ~~their~~ designee may require additional monitoring devices if, after a field inspection with the monitors in place, additional monitoring appears appropriate or necessary to establish compliance with the provisions of this article.

(c) *Location of seismograph equipment.* Blast intensity must be monitored in all four compass directions. Seismic monitoring equipment must be located at the nearest structure not owned by the Developer that is within one mile of the blast site boundary. If no structure exists within one mile of the blast site, then the measurement will be taken at the one mile mark in the direction of the nearest structure, or as otherwise determined by the Board the blasting permit approval.

(d) *Inspection of seismograph equipment.* Code Enforcement is required to inspect all monitoring equipment prior to the blast. The user or developer must facilitate these inspections, including the provision of transportation over difficult terrain, if necessary.

(e) *Contemporaneous reporting requirements.* A copy of the paper read out (strip chart), or other media specifically approved by the Director as part of the blasting permit, from each unit recording the blast activity must be provided to the Code Enforcement inspector immediately after the blast. A copy of the paper read out (strip chart) from each unit recording the blast activity must be provided to the County along with the standard blast report. The strip chart must include a full wave form and specifically identify the exact monitoring location; the date, time and place of the blast activity, the PPV, frequency and airblast overpressure; and be signed by the seismograph operator.



(f) *Followup reporting requirements.* The user must submit the following written documents to Lee County Code Enforcement by 10 a.m. the workday following the blast.

- (1) Copy of the ~~daily shot~~ Lee County standard blast report that includes all of the blast record keeping information identified in section 3-13.
- (2) A copy of the digital data generated by each required seismograph unit, with a copy of the corresponding printed strip chart attached.

**Sec. 3-16. Pre- and post-blast condition surveys.**

(a) *Generally.*

- (1) All condition surveys must be conducted by a professional with the appropriate credentials and experience. A copy of the *curriculum vitae* or resume detailing the reviewer's credentials must be attached to each survey report.
- (2) Condition surveys must be made available as follows:
  - a. *Pre-blast condition survey:* A copy, including color copies of all photos, must be provided to the owner of the structure or facility surveyed and Lee County Code Enforcement prior to the detonation of any blasts allowed under the permit.
  - b. *Post-blast condition survey:* A copy, including color copies of all photos, must be provided to the owner of the structure or facility surveyed and Lee County Code Enforcement upon completion, but no later than 10 days after the physical survey date.
- (3) *Content of condition survey report.* The survey must document the current interior and exterior condition of the structure, facility, pool, seawall, dock, driveway, foundation, well, sprinkler system, utilities, drainage facility, water management facility, concrete slab or other improvements on the property that is the subject of the survey. The survey must include sufficient documentation to satisfy all typical insurance carrier requirements related to substantiating a claim for damage, including but not limited to, documenting the status of the structural engineering.
- (4) *Cost.* The cost of condition surveys will be borne by the user, blaster and developer.

(b) *Pre-blast condition survey.*

- (1) ~~4,500~~ 1,000 foot radius around blast site. [Note: study says should be 500'.]

Prior to conducting blasting activity, the user and developer must obtain a professional pre-blast condition survey for all structures and facilities within a ~~4,500~~ 1,000 foot radius of the blast site. Structures and facilities touched by the ~~4,500~~ 1,000 foot radius measurement, must be included in the survey requirement.

The professional conducting the survey must provide a written notice to the owner and tenants of the property. This notice must indicate the reason for the survey, the proposed date and time of the survey, and a local or toll free contact number for purposes of scheduling an alternative date or obtaining additional information. A copy of this notice must be provided to Code Enforcement.

If the owner of the structure or facility refuses to allow access to conduct the pre-blast survey, the professional attempting to survey the property must note this on the survey form. The property owner should sign the form to verify refusal. At least three attempts must be made to notify the owner of the need for the survey. The user and developer have the burden to prove the property owner refused the pre-blast survey. Sufficient proof of refusal will consist of either: (a) a written document signed by the property owner stating they understand the purpose of the blast survey and refuse to have it conducted; or (b) a sworn affidavit from the professional hired to conduct the survey setting forth the details related to the property owner's refusal, including a narrative about the attempts to obtain permission to conduct the survey, and the information provided to the property owner regarding condition surveys.

A copy of all pre-blast surveys, including documentation as to any property owner's refusal, must be submitted to Code Enforcement prior to conducting the permitted blasting activity.

- (2) ~~4,500~~ 1,000 foot and ~~3,000~~ 2,000 foot radius around blast site. [Note: study says this should be area between 500' and 1,500'.]

In addition to the surveys required under ~~subsection 3-16(b)(1)~~, the user and developer must provide a viable opportunity for a professional pre-blast condition survey to be conducted on all structures and facilities falling within a distance of ~~4,500~~ 1,000 to ~~3,000~~ 2,000 feet from the blast site. Structures and facilities touched by the ~~3,000~~ 2,000 foot radius measurement must be included in the survey.

The professional conducting the survey must provide a written notice to the

owner and tenants of the property. This notice must indicate where and when the blasting activity will occur, the reason for the survey, and a local or toll free contact number for purposes of scheduling a date and time for the survey or obtaining additional information. A copy of this notice must be provided to the County.

The notice offering a pre-blast survey must be sent at least 20 days prior to the start of blasting activity via regular and certified mail. Sufficient time must be provided to allow scheduling and completion of all pre-blast condition surveys requested before the blasting activity occurs. Prior to commencement of blasting activity, the user or developer must submit a sworn affidavit to Code Enforcement indicating the notice offering a pre-blast condition survey was sent to all property owners within the designated area and all pre-blast surveys requested are complete. The affidavit must include an attachment identifying the names and addresses used in sending the notices.

(c) *Post-blast condition survey.*

Upon completion of the blasting allowed under the permit, the user and developer will obtain professional post-blast condition surveys for properties, structures or facilities that are the subject of damage complaints or claims made during the course of the blasting activity. A list of all property owners filing a complaint with the County will be compiled by Code Enforcement.

The professional conducting the survey will contact each property owner in writing, via certified mail, to schedule a mutually convenient date and time for the post-blast survey. The surveys must be completed within 15 days after cessation of the blasting activity. A copy of the condition survey report must be provided to the property owner and Code Enforcement upon completion, but no later than 10 days after the physical survey date.

The Developer must submit a sworn affidavit within 30 days after the cessation of the blasting activity that identifies the location of the properties offered a post-blast condition survey; property owners' names and the mailing addresses used to extend the offer; and whether the survey was completed or refused. No further blasting permits will be issued within unincorporated Lee County for projects in which this developer is a principal, beneficiary, or subsidiary until this affidavit is filed.

(d) *Content of condition survey.* The condition survey must include a written description of the interior and exterior condition of each structure or facility examined. Existing cracks, damage or other defects must be specifically located and described with sufficient specificity to make it possible to determine the effect, if any, of the proposed blasting activity. If significant cracks or damage exist or if the defects are too complicated

to describe in writing, photographs must be taken to supplement the survey. In lieu of the written survey report, a good quality videotape survey, with appropriate audio description of locations, conditions and defects may be substituted. A copy, in whatever form created, must be provided to the property owner and Code Enforcement prior to approval for subsequent blasting activity on projects within unincorporated Lee County.

The survey must be kept for a minimum of seven years and be available upon request.

**Sec. 3-20. Violations and penalties.**

*[Blasting study suggests that relief from the one strike rule should be provided for the field blaster. The study does not suggest relief for the licensed user, engineer or developer.]*

**County Staff proposal**

*[County staff has indicated that the rule as stated below has been very effective because it is clear and unequivocal. It is also consistent. Therefore, staff recommends that the rule be retained as revised below.]*

(a) *Intensity violation.* Blasting activity that: exceeds the limitations set forth in section 3-8 for PPV or airblast overpressure at the locations specified in section 3-8(a); ~~or, the 80% rule;~~ or, fails to measure and record the blast intensity at the nearest structure not owned by the developer in accordance with sections 3-8 and 3-15 constitutes an "intensity violation" under this article. Intensity violations will precipitate the following action:

- (1) A fine of \$5,000 against the user, blaster, engineer and developer, who will be jointly liable for the full amount of this fine. The fine is due and payable upon issuance of the County citation;
- (2) Automatic revocation of the blasting permit;
- (3) No further blasting permits will be issued for the development project, including all future phases of the project. Disputes as to the scope of the development project for purposes of this subsection will be decided by the Director; and,
- (4) No further blasting permits will be issued to the user, blaster or the company or business entity qualified or associated with the user for a period of 5 years. The fact that a new user is obtained to qualify a company does not eliminate the sanction. The user will not be eligible to qualify any other companies or entities for purposes of blasting in unincorporated Lee County for a period of 5 years. The blaster will not be permitted to act as the responsible blaster for purposes of blasting in unincorporated Lee County for a period of 5 years.

## ***Blasting Ad Hoc Committee Proposal***

(a) Intensity violation under 0.50PPV. Blasting activity that exceeds the limitations set forth in section 3-8 for PPV or airblast overpressure at the locations specified in section 3-8(a); ~~or, the 80% rule~~; or, fails to measure and record the blast intensity at the nearest structure not owned by the developer in accordance with sections 3-8 and 3-15 constitutes an “intensity violation” under this article. Intensity violations are cumulative and run against the user, blaster, developer, engineer and total development project (all phases). For example, if a user received an intensity violation for project A and several years later receives a intensity violation from project X, the intensity violation for project X is considered a second violation. Intensity violations will precipitate the following action:

(1) First and Second violation:

The following will occur, if the blast intensity violation is above 0.3PPV and under 0.49 PPV.

- a. A fine of \$5,000 against the user, blaster, engineer and developer, who will be jointly liable for the full amount of this fine. The fine is due and payable upon issuance of the County citation; and
- b. All work under the blasting permit must cease for 7 days. Provided, however, blasting activity will be permitted to resume only after the user obtains approval for a modification of the blasting permit that will ensure the blasting intensity does not exceed the intensity limitation set for in section 3-8(b). The proposed modification must be based upon an investigation and report as to what caused the violation. This report must outline alternatives for remedial action to correct the problem identified by the investigation.

(2) Third Violation

- a. Violation is the third against blaster or user.
  1. Automatic revocation of the blasting permit; and
  2. No further blasting permits will be issued to the user, blaster or the company or business entity qualified or associated with the user for a period of 5 years. The fact that a new user is obtained to qualify a company does not eliminate the sanction. The user will not be eligible to qualify any other companies or entities for purposes of blasting in unincorporated Lee County for a period of 5 years. The blaster will not be permitted to act as the responsible blaster for purposes of blasting in

unincorporated Lee County for a period of 5 years.

b. *Violation is the third against the developer.*

1. Automatic revocation of the blasting permit; and
2. No further blasting permits will be issued to the developer or the company or business entity associated with the developer for a period of 5 years. A new entity, with common principals or tangentially related principals may not be created to avoid this sanction.

c. *Violation is the third against the development project (all phases).*

1. Automatic revocation of the blasting permit; and
2. No further blasting permits will be issued for the development project, including all future phases of the project. Disputes as to the scope of the development project for purposes of this subsection will be decided by the Director.

(b) *Intensity violation over 0.50PPV.* If blasting activity precipitates 0.50 PPV reading or higher on any seismograph monitoring the blasting under the development blasting permit, then the following will occur:

- (1) A fine of \$5,000 against the user, blaster, engineer and developer, who will be jointly liable for the full amount of this fine. The fine is due and payable upon issuance of the County citation;
- (2) Automatic revocation of the blasting permit;
- (3) No further blasting permits will be issued for the development project, including all future phases of the project. Disputes as to the scope of the development project for purposes of this subsection will be decided by the Director; and,
- (4) No further blasting permits will be issued to the user, blaster or the company or business entity qualified or associated with the user for a period of 5 years. The fact that a new user is obtained to qualify a company does not eliminate the sanction. The user will not be eligible to qualify any other companies or entities for purposes of blasting in unincorporated Lee County for a period of 5 years. The blaster will not be permitted to act as the responsible blaster for purposes of blasting in unincorporated Lee County for

a period of 5 years.

(bc) *Non-intensity violation.* Violation of the provisions of this article, other than those applicable to blast intensity, constitute a “non-intensity violation”. Non-intensity violations will precipitate the following action:

- (1) Imposition of a fine against the user, blaster and developer, individually or jointly. The fine is due and payable based upon issuance of the County citation. Fine amounts are set forth in the Lee County Administrative Code.
- (2) Automatic suspension of the current blasting permit. The permit may be reinstated at the discretion of the Director if:
  - a. The violation is abated to the Director’s satisfaction; and
  - b. The information requested by the Director is submitted and found sufficient by the County.
- (3) Potential revocation of the blasting permit based upon the nature of the violation and the history of violator’s compliance.

## **SECTION TWO: CONFLICTS OF LAW**

Whenever the requirements or provisions of this Ordinance are in conflict with the requirements or provisions of other lawfully adopted ordinances or statutes, the most restrictive requirements will apply.

## **SECTION THREE: SEVERABILITY**

It is the Board’s intent that if any section, subsection, clause or provision of this ordinance is deemed invalid or unconstitutional by a court of competent jurisdiction, such portion will become a separate provision and will not affect the remaining provisions of this ordinance. The Board further declares its intent that this ordinance would have been adopted if such unconstitutional provision was not included.

## **SECTION FOUR: CODIFICATION AND SCRIVENER’S ERRORS**

The Board of County Commissioners intend that this ordinance will be made part of the Lee County Code; and that sections of this ordinance can be renumbered or relettered and that the word “ordinance” can be changed to “section”, “article” or some other appropriate word or phrase to accomplish codification, and regardless of whether this ordinance is ever codified, the ordinance can be renumbered or relettered and typographical errors that do not affect the intent can be corrected with the authorization of the County Administrator, County Manager or his designee, without the need for a public

hearing.

**SECTION FIVE: EFFECTIVE DATE**

The ordinance will take effect upon filing with the Secretary of State.

The foregoing resolution was adopted by the Board of County Commissioners by a motion by Commissioner , and seconded by Commissioner and, when put to a vote, the result was as follows:

JOHN E. ALBION  
ROBERT P. JANES  
DOUGLAS R. ST. CERNY  
RAY JUDAH  
TAMMARA HALL

DULY PASSED AND ADOPTED this    day of    .

ATTEST:  
CHARLIE GREEN, CLERK

BOARD OF COUNTY COMMISSIONERS  
OF LEE COUNTY, FLORIDA

By: \_\_\_\_\_  
Deputy Clerk

By: \_\_\_\_\_  
, Chairman

APPROVED AS TO FORM:

By: \_\_\_\_\_  
Dawn E. Perry-Lehnert  
Office of the County Attorney

Blasting Study Comments-Redline  
Ad Hoc Blasting Committee - Peach  
County Staff - Yellow





**Executive Summary  
Lee County Blasting Study**

By

Terra Dinamica LLC

This study completed under contract number 2983,  
CN 04-17 for Lee County, Florida

December 1, 2004 – June 30, 2005

Researchers:

Frank J. Lucca  
Andrew Williams

Report Date: June 2005

*Terra Dinamica LLC  
5 Meadow Brook Road  
Granby, CT 06035  
Tel: (860) 844-0506, Fax: (860) 844-0507  
explosives@terradinamica.com, www.terradinamica.com*

**Executive Summary**  
**Lee County Blasting Study**  
**June, 2005**

**Introduction**

This project involved research, testing and scientific analysis of land development blasting in unincorporated Lee County. The purpose was to determine if land development blasting can be done without damage or other detrimental impacts to residences, other structures, public utilities or groundwater resources given the local geology of the County. Also, the purpose was to apply science to the Lee County regulations concerning blasting and to determine if they are too stringent or can be further restricted.

Terra Dinamica LLC was contracted by Lee County Florida to undertake this study. The study also investigated how rock blasting from development blasting affects structures in relationship to other environmental and manmade influences. The study included research on alternate technologies to blasting, state-of-the-art blasting techniques and technologies, and a literature search of other blasting and vibration studies.

The study was started on January 1, 2005 and proceeded through June of 2005. The study is unique in that it used a set of Test Houses, which were near blasting projects and Control Houses, which were not near any blasting.

Wireless micro-accelerometers and weather stations manufactured by Crossbow Technologies, Inc and Blasting type commercial seismographs manufactured by White Industrial Seismology, Inc, were the instrumentations used to wire the houses.

Two control houses in the county were used in different geographical locations. One control house was located on Fort Myers Beach and the other in the Winkler Road Extension, where a moratorium on blasting had been imposed.

One test house was located near a blasting project in a development north of Fort Myers. This development, Herons Glen, had to use blasting in construction of the water retention facilities for water management in an adjacent development.

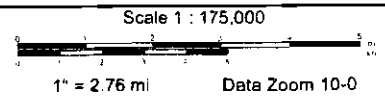
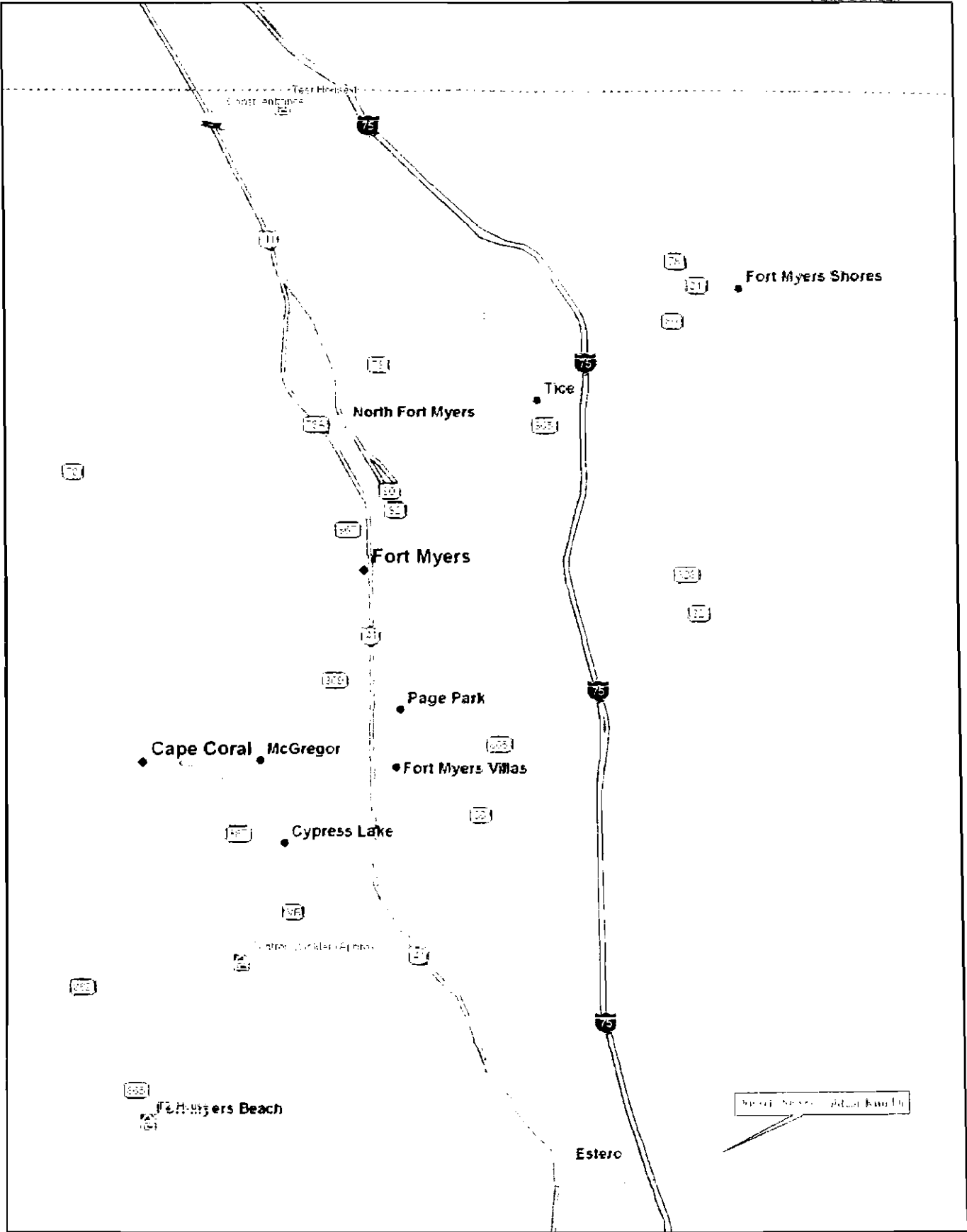
Due to the unavailability of multiple development blasting projects, two other test houses were located in Estero area of Lee County. The houses were located on Wildcat Run near multiple quarry operations. The closest quarry cooperated fully and shared all of its records.

The regulations in Lee County are based solely on Peak Particle Velocity. Therefore, the blasting study is based solely on the effects of Peak Particle Velocities generated from blasting, equipment, other manmade induced vibrations, and environmental effects. The

regulation peak particle velocity limit of 0.3 inches/second was the vibration limit imposed on the contractors during this study.

The study was performed to ascertain appropriate blasting limits. Due to the Lee County Blasting Regulation, the use of test houses and control houses facilitated the tracking of the effects of blasting verses environmental and other manmade influences on structures.

The use of the wireless micro-seismographs and the chosen commercial seismographs made it easier for blast monitoring in areas where higher blast peak particle velocities could be obtained and the comparison to other influences on the structures.



## Findings

### *Vibration limit*

From the results of this study, the current blast vibration limit of 0.3 inches/second (ips) is extremely conservative. The 0.3 ips limit falls well within the range of environmental effects and other manmade induced vibration; or in other words, is within the ambient vibrations levels of the county. The probability is low to nonexistent that blast vibration, if maintained below the limit, will cause any damage to neighboring residential and commercial properties.

A good rule of thumb for calculating vibration intensities follows: Under normal or typical conditions, the vibration intensity dies (attenuates or decays) to about 1/3 of its intensity every time the distance traveled doubles. In other words, if the Peak Particle Velocity at 600 feet from a blast is 0.3 inches/second, the intensity at 600 feet directly behind this monitoring point (1200 feet from blast) would roughly be equivalent to 0.1 inches/second.

Displacement is the damaging factor in vibration. Displacement can be defined as the amount of deviation or distance of any particle or point from its rest position. The change in displacement over a unit of time is called strain. In other words, a particle moves and stays at the position it moved to instead of returning to its normal position. Large displacements cause damage. These displacements are caused by high peak particle velocities with relatively low frequencies.

A simple formula to convert to displacement is to use the known measurement of Peak Particle Velocity (PPV) and Frequency (f). Many blasting seismographs will also report displacement. The formula follows:

$$\text{Displacement} = \text{PPV}/(2\pi) \times (f)$$

For example, using 0.3 inches per second and a frequency of 30 hertz, the displacement would equal 0.00159 inches. A graph follows displaying displacement at different frequencies utilizing a 0.3 inches/second peak particle velocity. As can be seen, displacements are extremely low. None of which can cause damage. This is the reason by utilizing 0.3 ips as the Peak Particle Velocity limit that frequency can be ignored.

<b>PPV = 0.3 inches/second</b>					
<b>Freq</b>	<b>Displacement</b>				
5	0.00955	35	0.00136	100	0.00048
10	0.00477	40	0.00119	150	0.00032
15	0.00318	45	0.00106	200	0.00024
20	0.00239	50	0.00095	250	0.00019
25	0.00191	70	0.00068	300	0.00016
30	0.00159	80	0.00060	1000	0.00005
		90	0.00053		

In comparison, here is the same table using 2.0 inches/second and the third table utilizes 5.0 inches/second.

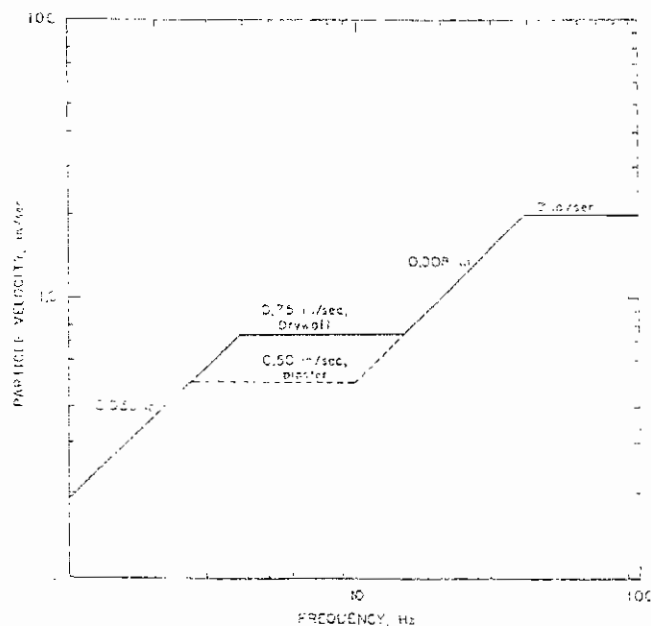
		<b>PPV = 2.0 inches/second</b>			
<b>Freq</b>	<b>Displacement</b>				
5	0.06366	35	0.00909	100	0.00318
10	0.03183	40	0.00796	150	0.00212
15	0.02122	45	0.00707	200	0.00159
20	0.01592	50	0.00637	250	0.00127
25	0.01273	70	0.00455	300	0.00106
30	0.01061	80	0.00398	1000	0.00032
		90	0.00354		

		<b>PPV = 5.0 inches/second</b>			
<b>Freq</b>	<b>Displacement</b>				
5	0.15916	35	0.02274	100	0.00796
10	0.07958	40	0.01989	150	0.00531
15	0.05305	45	0.01768	200	0.00398
20	0.03979	50	0.01592	250	0.00318
25	0.03183	70	0.01137	300	0.00265
30	0.02653	80	0.00995	1000	0.00080
		90	0.00884		

There have been multiple studies on blast induced vibration damage. During the literature search, the following was found and verified for construction and quarry blasting. 2.0 inches/second is still a good limit to prevent damage if the USBM “Z” curve is followed in regards to frequency.

**“Z” Curve: Line shows zero probability of damage.**

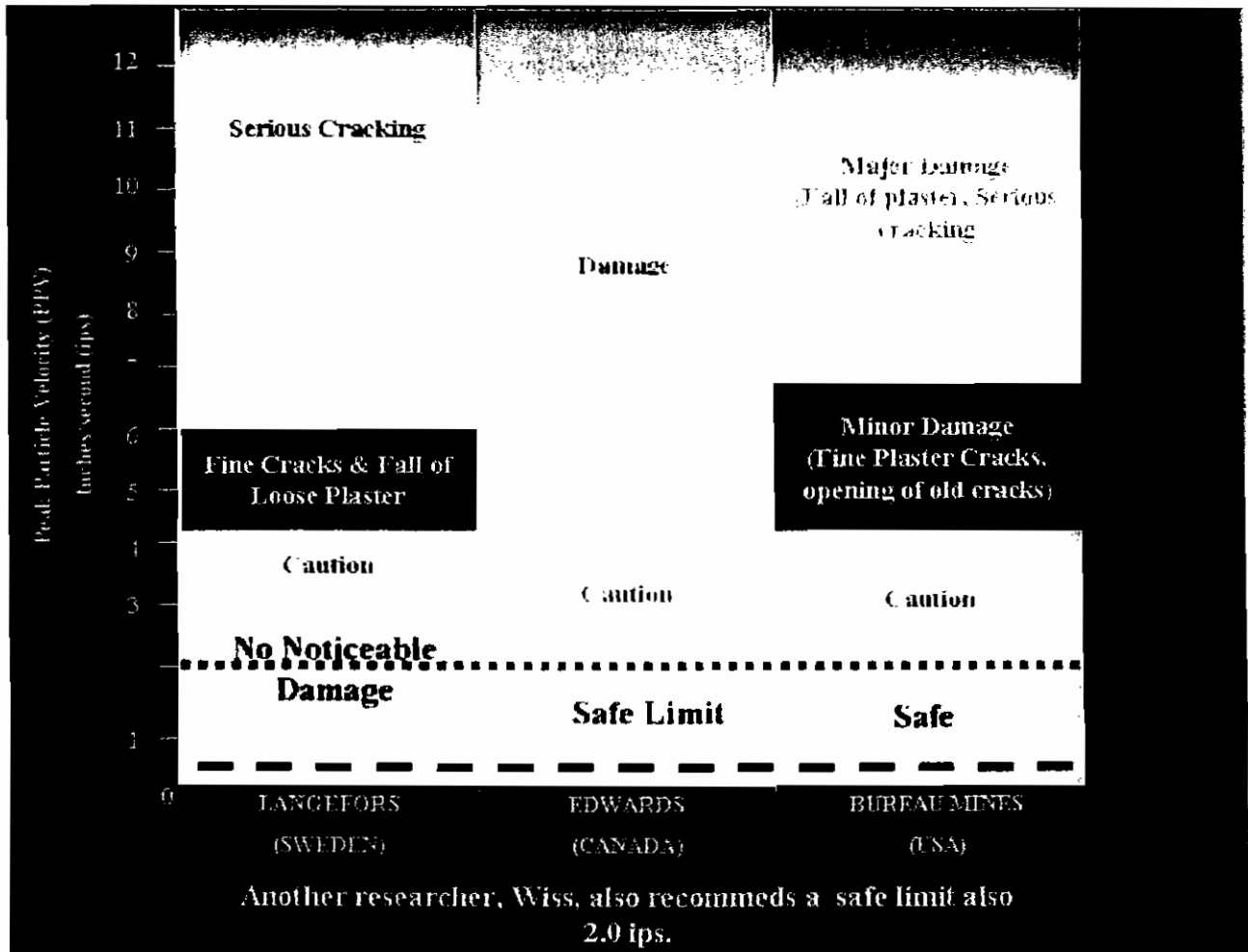


In actuality, since the USBM "Z" curve was developed for large scale mining operations, it could be followed as the limit for vibration without causing damage. But, humans are extremely receptive to vibration, and if this curve were followed, there would likely be many more complaints.

This curve represents the zero line of probability of damage in large scale and long-term blasting operations, such as coal. When used in construction blasting, as done in Lee County, the curve becomes even more conservative.

Here are results from multiple research projects:

**Vibration Levels: 4 researchers in 4 different studies developed the same results.**





From the results of the Lee County Blasting Study and the literature search, it can be concluded that the 0.3 inches/second limit is extremely safe.

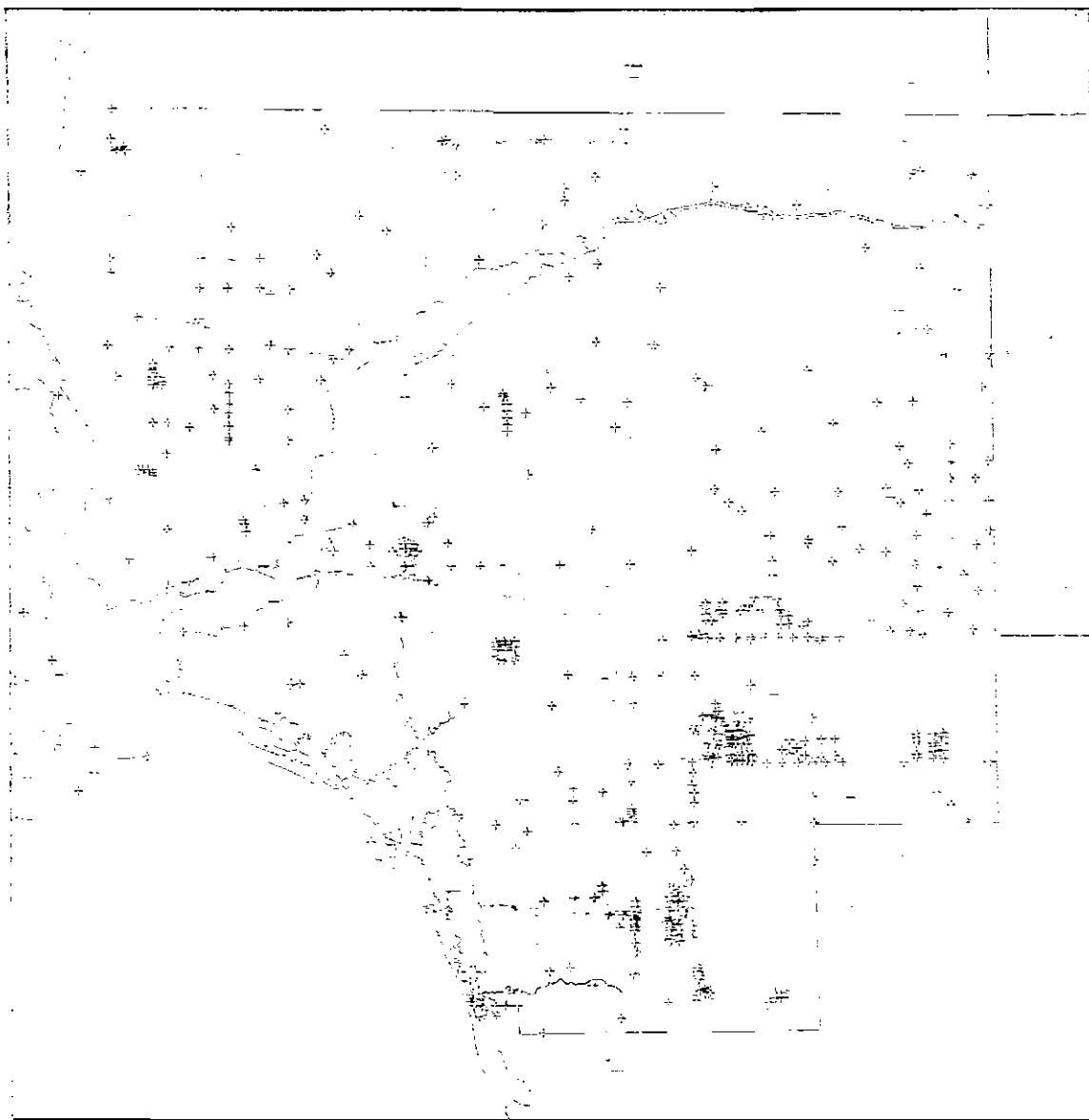
### **Geology**

Rock blasting for development takes place in the upper layers.

The findings in regards to the geology of the area include the fact that nothing is atypical or special about the area. The geology is typical of that found within the Caribbean basin. There is a high presence of ground water and unconsolidated sediment and manmade fill in the area. These 2 influences will cause the frequency component of the blast induced vibration to be relatively low. Humans are very perceptive to low vibration frequencies. But, due to the low peak particle velocity limits (0.3 inches/second), frequency can be basically ignored in regards to damage potential in this type of blasting.

The following data was provided by geologist Greg Rawl, who was performing a ground water study for Lee County. This data was verified and supplemented from a literature search performed by Terra Dinamica LLC.

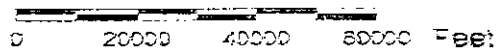
SERIES	GEOLOGIC UNIT		HYDROGEOLOGIC UNIT		VIEWLOG GEOLOGIC UNITS
HOLOCENE PLEISTOCENE	UNDIFFERENTIATED		SURFICIAL AQUIFER SYSTEM	SURFICIAL SEDIMENTS	HOLOCENE
PLIOCENE	TAMIAMI FORMATION			PINECREST LIMESTONE	PLIOCENE
				BONITA SPRINGS MARL CONFINING BED	BONITA SPRINGS MARL
			LOWER TAMIAMI AQUIFER	OCHOPEE	
MIOCENE	HAWTHORN GROUP	PEACE RIVER FORMATION	UPPER PEACE RIVER CONFINING BED	UPPER PEACE RIVER CONFINING	
			SANDSTONE AQUIFER	SANDSTONE	
			BASAL PEACE RIVER CONFINING BED	BASAL PEACE RIVER CONFINING	
		ARCADIA FORMATION	MID-HAWTHORN AQUIFER	ARCADIA	
			BASAL MID-HAWTHORN CONFINING BED	BASAL MID-HAWTHORN CONFINING	
OLIGOCENE	SUWANNEE LIMESTONE		LOWER HAWTHORN AQUIFER	LOWER HAWTHORN	
			UPPER FLORIDAN AQUIFER	SUWANNEE	
			FLORIDAN AQUIFER SYSTEM		



N



Scale

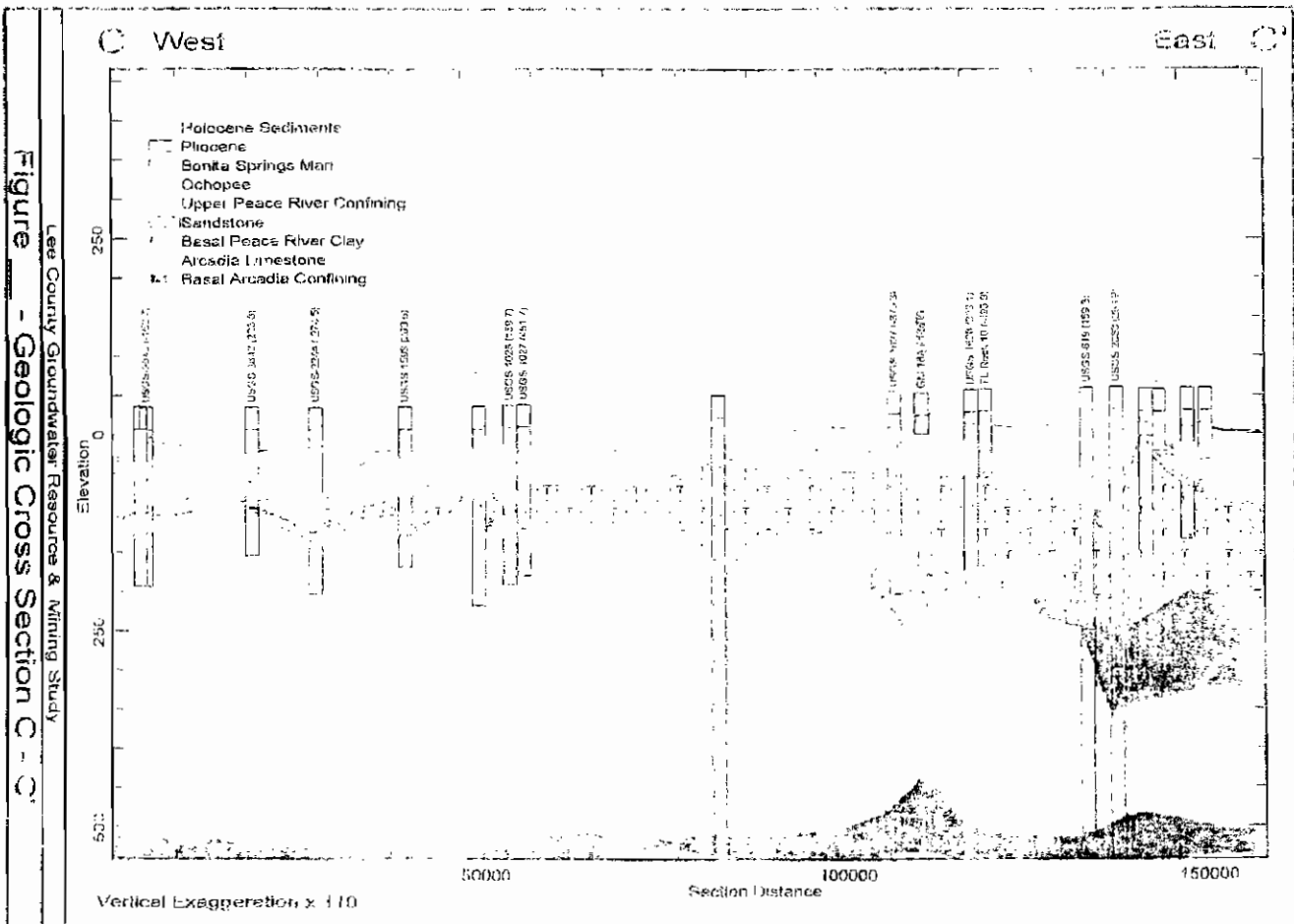


Lee County Groundwater Resource & Mining Study

Greg F. Rawl, P.G.

*Professional Geologist*  
Specializing in Geology and  
Groundwater Resources

Figure \_\_\_ - Geologic Cross Section  
Location Map



### ***Environmental Effects***

There was a high degree of change in humidity and temperature inside and outside of the houses. These high degrees of change will cause expansion, shrinkage, and settling of houses and other structures.

The following was found during the literature search and falls closely to the Lee County Study Results.

Typical Environmental Stresses, other Forces, and Equivalent Ground Vibrations from a study by Lewis Oriard turned out close to the Lee County Study.

<b>Force</b>	<b>Peak Particle Velocity</b>	<b>Note</b>
Inside Humidity	3	19% Change
Outside Humidity	5	35% Change
Inside Temp	3.6	12 Degree Far. Change
Outside Temp	8.2	27 Degree Far. Change
Wind	3.5	23 MPH
Walking	0.3	Measured at Wall Corner
Jumping	1	Midwall in Same room
Door Slam	0.5	Wall in next room
Sliding Door Slam	1.5	Wall above door
Picture nails	2	Midwall Nearby
<b>Blast Limits</b>	<b>2</b>	

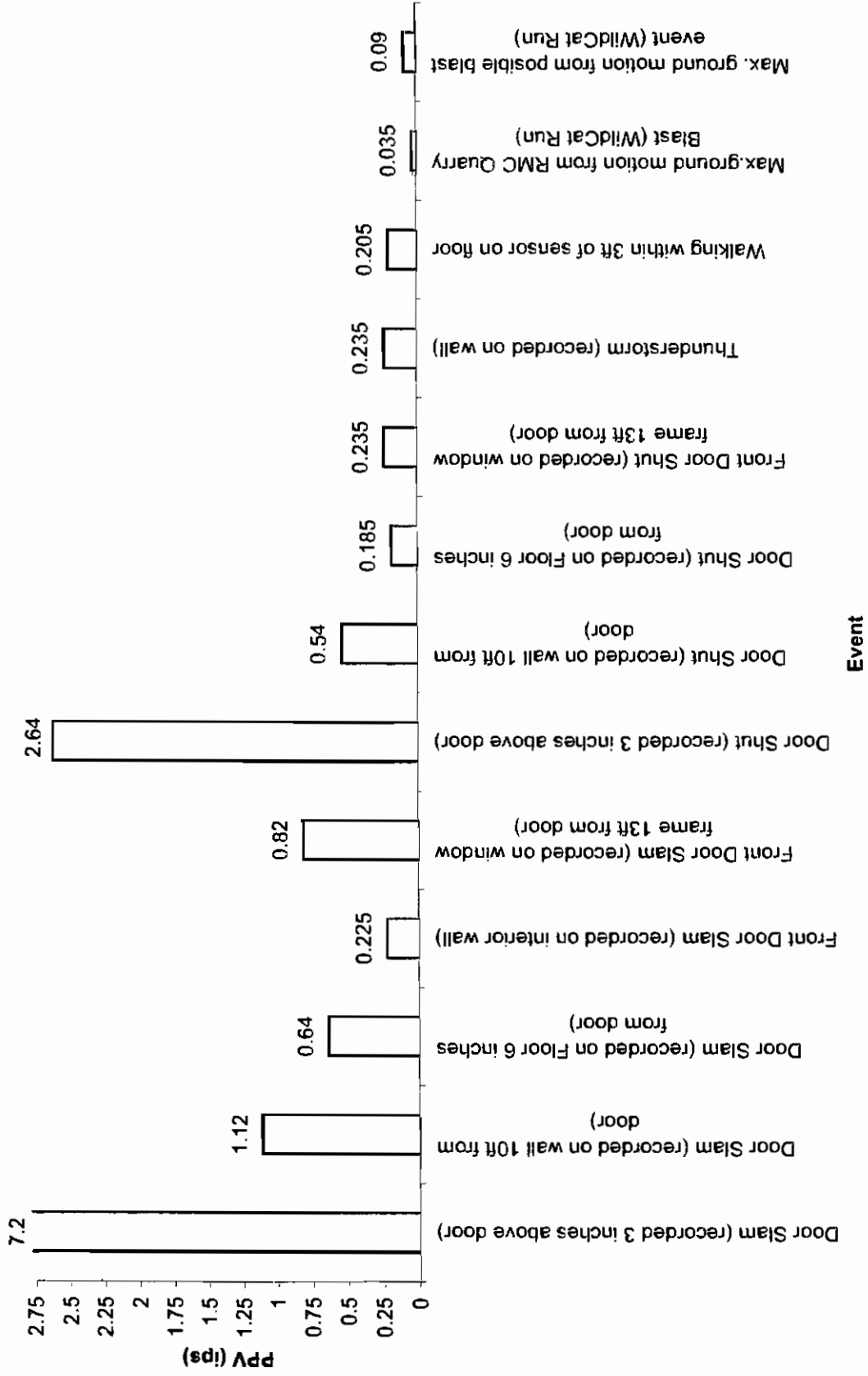
"The Effects of Vibrations and Environmental Forces"- By Lewis Oriard

The 3 test houses (near blasting) and the 2 control houses (not near blasting) had instrumentation installed to monitor vibration, humidity change, and temperature change. The test houses near the blasting did not show any signs of damage from blasting nor environmental changes since the instruments were installed. The control house on Winkler Road Extension also did not show any damage. The control house on Fort Myers Beach did show cracking (not near blasting).

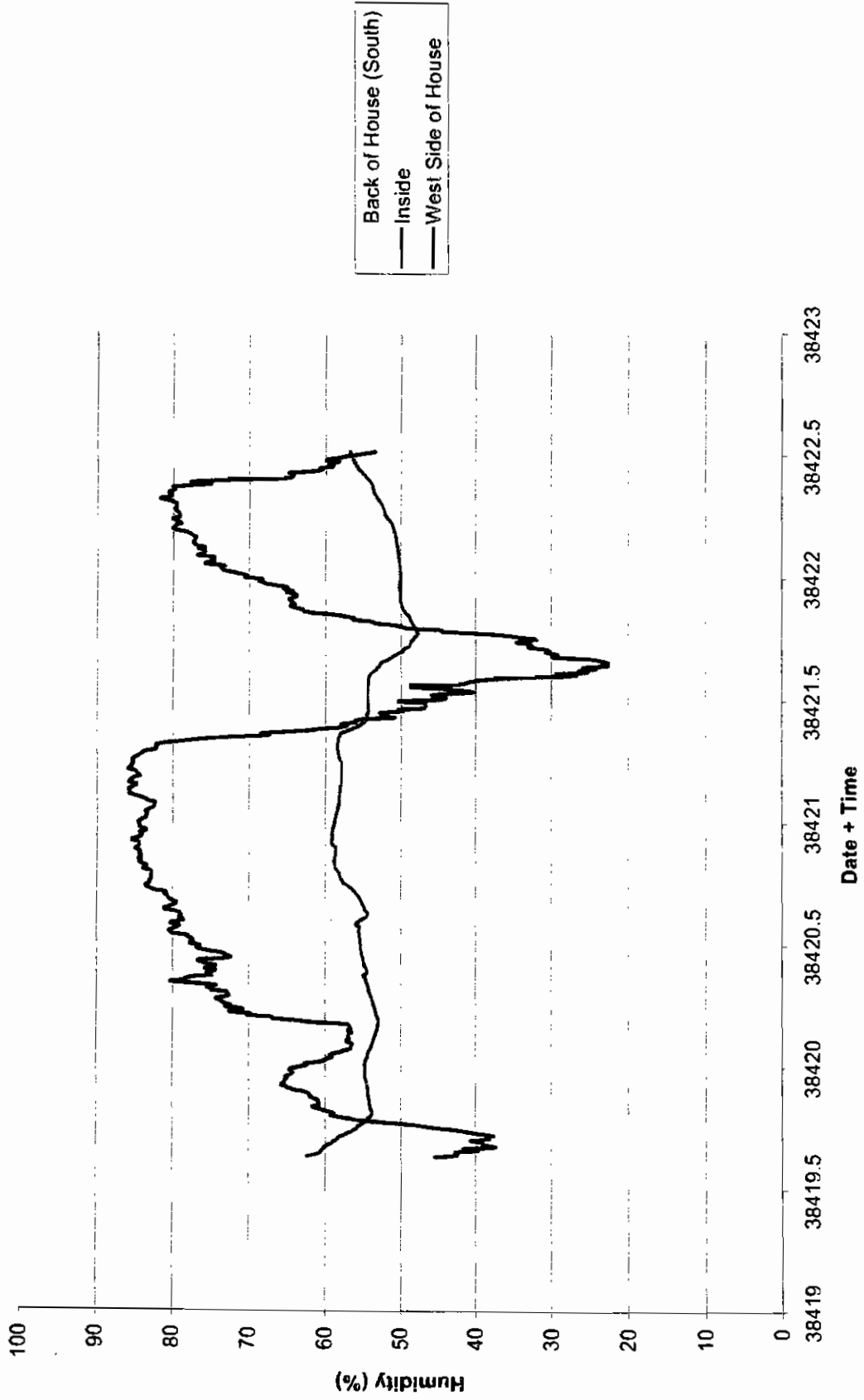
The vibrations caused by normal daily activities are in the range from 0.001 inches/second up to over 2 inches/second. The peak particle velocity limit for development blasting in Lee County is 0.3 inches/second. This limit falls in the range of ambient vibration experienced by structures.

An example of data follows:

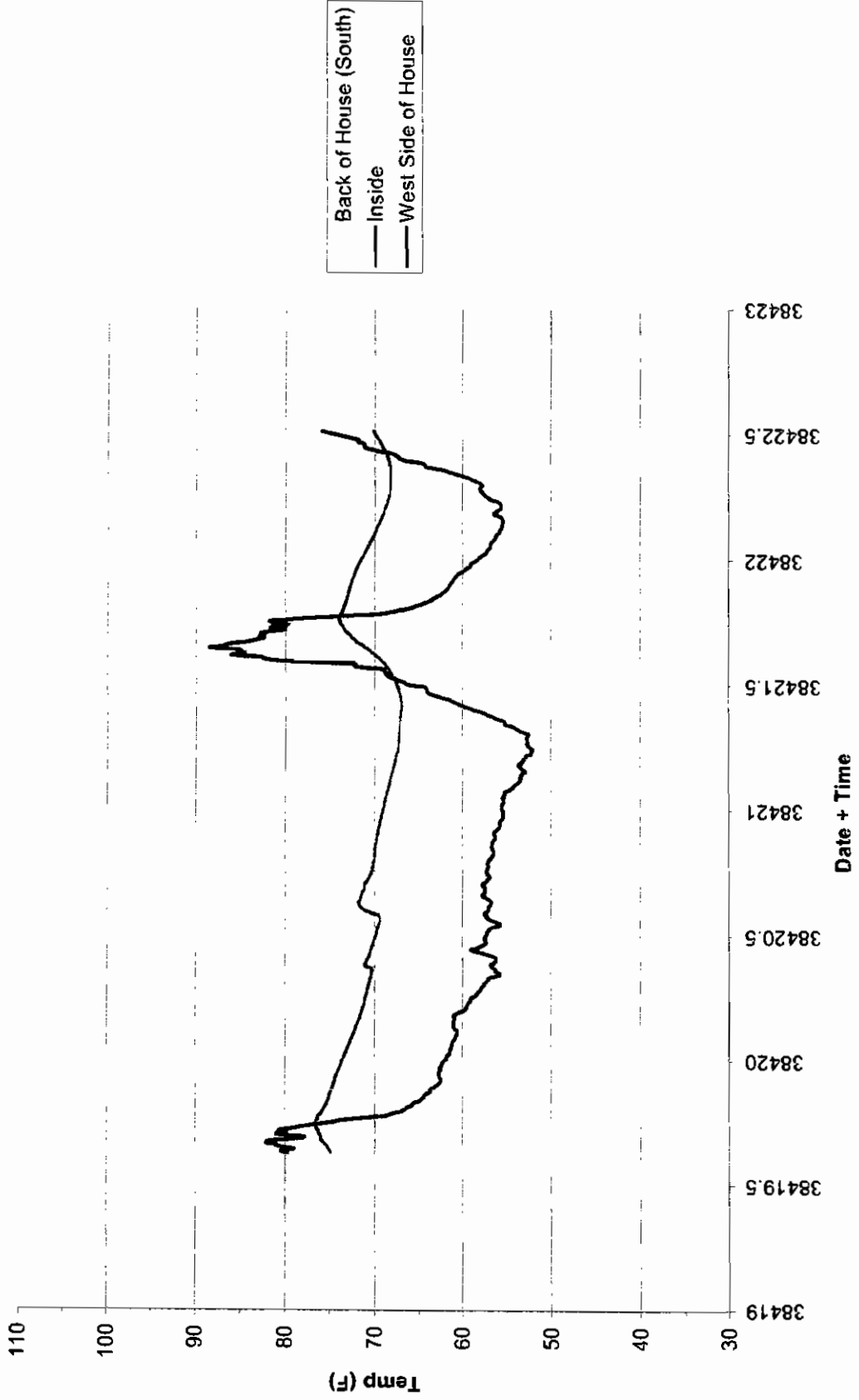
### Comparison of Vibration Events



### Comparison of Humidity at Control Home on Winkler Extension



### Comparison of Temps at Control Home on Winkler Extension



## Recommendations

The study has shown that the probability of damage from blasting with the 0.3 ips limit is low to nonexistent and this level is more or less equal to ambient levels found in the county. Since the blasting contractors have shown that they can blast without undue hardship to the current level of 0.3 ips at an inhabited structure (residence or business), the level should not be altered.

Recommendations include multiple code changes and can be found in the included presentation in section 9, Findings, but are repeated here.

Recommendations are totally related to changes in the Lee County Blasting Code and can be found in Section 11. Stated here are code changes in bullet format as presented to the Lee County Blasting Committee.

- Code:
  - ✓ Sec. 3-4. Local user and blaster registration
    - Require 8 hours of continuing education/year.
      - Blasting courses: Private, Explosives Manufacturers and distributors MSHA, OSHA, Conferences, etc.
  - Sec. 3-8. Limitations on blasting intensity.
    - 4 Compass directions: But put in a location where a reading can be obtained and used. Extrapolate to structure of concern.

(b) Blast intensity may not exceed any of the following limits:

- Peak Particle Velocity (PPV): Not peak vector sum (Resultant). It has been noted that the code enforcement officers for Lee County are using the correct PPV, but the seismic monitoring companies and blasting company has been known to use the PVS.
  - Peak Vector Sum is the Sum of the 3 Peaks in the vibration wave. This gives a higher number but is not a true representation.
  - The code says PPV, but everyone has been working with PVS.

✓ (b) Blast intensity may not exceed any of the following limits:

Peak Particle Velocity (PPV):

Occupied Structure (Residence or business): 0.30 inches per second

Utilities: 5.0 inches/second

Roads: PPV of 10 inches/second. Roadway outside of fracture zone of blast. May need a test blast to determine extent of fracture zone.

Bridges: 5.0 inches/second.

Airblast overpressure:

134 dB (linear) at Residence or business

Not applicable at other structures



C: Delete the 80% rule:

Sec. 3-9. Limitation on blasting activity.

- Eliminate “No Blast” zone. 600 foot rule is not necessary. 0.3 ips is the limit. Doesn’t matter at what distance.
- When close to residences or businesses, cover should be used. Rubber tire blasting mats should be used for distances 300 feet or less to a structure of concern. Between 600 feet to 301 feet, in place overburden or additional cover (sand or dirt) of at least 3 feet should be used. If blasting mats are used, additional cover is not needed.

Sec. 3-10. Blasting permit issuance; standard permit conditions.

Should not be a board issue. Should be issued or denied by the director if all conditions are met.

Sec. 3-13. Record keeping.

Add a standard blast report or blaster uses equivalent for the county that includes the following as a minimum:

- Date and time of blast
- Number of holes
- Depth
- Blast Pattern diagram and firing times
- Number of wet holes, water depth
- Hole diameter
- Burden & Spacing
- Amount of explosives
- Number of primers
- Type of detonators (i.e., electric or nonelectric);
- Number of detonators
- Stemming feet & type used
- Maximum pounds delay
- Maximum hole delay
- Weather
- Wind direction
- Type and make of blasting machine
- Global positioning system direction and distance in feet to the nearest building
- Decking feet
- Location of each seismograph
- Peak particle velocity inches per second & frequency
- Sound decibels
- Name, address, and license number of user of explosives; and
- Name, address, and permit number of blaster.

Sec. 3-15. Blast vibration monitoring.

- Printout not needed in the field. Just need the readings to be verified by enforcement officer in 24 hours, but reported right after the blast in writing.
- Calibration: 6 months is excessive. Should be by manufacturer's recommendation. Usually 1 year, but some newer ones do not need to be calibrated.

Pre-blast Surveys

- ✓• 1500 foot radius is excessive. 3000' offered is current.
- Normal Industry practice is 250 feet.
- Recommendation: 500 foot radius or closest habitable structure in four compass directions.
- Offer out to 1500 feet.
  
- This goes back to 0.3ips limit at closest residence.

✓One Strike Rule

- Field Blaster needs some relief on this.
  - Following company blast plan.
  - 3 strikes? With a fine for every strike?
  - Project halted until everything is resubmitted? Maybe a minimum of 10 days?
  - Lose license for 30 days, 60 days, then 1 year. Plus \$15,000 fine paid by the blasting contractor for each occurrence.

✓Winkler Road Extension

- Remove the moratorium on blasting.