

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM  
REPORT

**134**

**DAMAGES DUE TO  
DRAINAGE, RUNOFF,  
BLASTING, AND SLIDES**

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BLASTING, AND SLIDES**

**HARRISON LEWIS, A. H. McDANIEL,  
R. BROOKS PETERS, AND D. M. JACOBS**

RESEARCH SPONSORED BY THE AMERICAN ASSOCIATION  
OF STATE HIGHWAY OFFICIALS IN COOPERATION  
WITH THE FEDERAL HIGHWAY ADMINISTRATION

AREAS OF INTEREST:  
LAND ACQUISITION  
LEGAL STUDIES

**HIGHWAY RESEARCH BOARD**  
**DIVISION OF ENGINEERING      NATIONAL RESEARCH COUNCIL**  
**NATIONAL ACADEMY OF SCIENCES – NATIONAL ACADEMY OF ENGINEERING      1972**

## NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Systematic, well-designed research provides the most effective approach to the solution of many problems facing highway administrators and engineers. Often, highway problems are of local interest and can best be studied by highway departments individually or in cooperation with their state universities and others. However, the accelerating growth of highway transportation develops increasingly complex problems of wide interest to highway authorities. These problems are best studied through a coordinated program of cooperative research.

In recognition of these needs, the highway administrators of the American Association of State Highway Officials initiated in 1962 an objective national highway research program employing modern scientific techniques. This program is supported on a continuing basis by funds from participating member states of the Association and it receives the full cooperation and support of the Federal Highway Administration, United States Department of Transportation.

The Highway Research Board of the National Academy of Sciences-National Research Council was requested by the Association to administer the research program because of the Board's recognized objectivity and understanding of modern research practices. The Board is uniquely suited for this purpose as: it maintains an extensive committee structure from which authorities on any highway transportation subject may be drawn; it possesses avenues of communications and cooperation with federal, state, and local governmental agencies, universities, and industry; its relationship to its parent organization, the National Academy of Sciences, a private, nonprofit institution, is an insurance of objectivity; it maintains a full-time research correlation staff of specialists in highway transportation matters to bring the findings of research directly to those who are in a position to use them.

The program is developed on the basis of research needs identified by chief administrators of the highway departments and by committees of AASHO. Each year, specific areas of research needs to be included in the program are proposed to the Academy and the Board by the American Association of State Highway Officials. Research projects to fulfill these needs are defined by the Board, and qualified research agencies are selected from those that have submitted proposals. Administration and surveillance of research contracts are responsibilities of the Academy and its Highway Research Board.

The needs for highway research are many, and the National Cooperative Highway Research Program can make significant contributions to the solution of highway transportation problems of mutual concern to many responsible groups. The program, however, is intended to complement rather than to substitute for or duplicate other highway research programs.

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The study reported herein was undertaken under the aegis of the National Academy of Sciences—National Research Council. The National Cooperative Highway Research Program, under which this study was made, is conducted by the Highway Research Board with the express approval of the Governing Board of the NRC. Such approval indicated that the Board considered that the problems studied in this program are of national significance; that solution of the problems requires scientific or technical competence, and that the resources of NRC are particularly suitable to the conduct of these studies. The institutional responsibilities of the NRC are discharged in the following manner: each specific problem, before it is accepted for study in the Program, is approved as appropriate for the NRC by the Program advisory committee and the Chairman of the Division of Engineering of the National Research Council.

The specific work to be performed in each problem area is defined by an advisory panel that then selects a research agency to do the work, monitors the work, and reviews the final reports. Members of the advisory panels are appointed by the Chairman of the Division of Engineering of the National Research Council. They are selected for their individual scholarly competence and judgment, with due consideration for the balance and breadth of disciplines.

Responsibility for the definition of this research project and for the publication of this report rests with the advisory panel. However, the opinions and conclusion expressed or implied are those of the research agency that performed the research, and are not necessarily those of the Highway Research Board, the National Research Council, the Federal Highway Administration, the American Association of State Highway Officials, nor the individual states participating in the Program.

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## **FOREWORD**

*By Staff*

*Highway Research Board*

This report will be of interest to those engaged in the practices of highway law and land acquisition. It outlines the status of law through 1969 in respect to damages resulting from drainage, runoff, blasting, and slides and will be found useful in the preparation of briefs pertaining to trial or appellate litigation involving these elements of damage, and, particularly, in inverse condemnation actions.

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During, or shortly after, highway construction special types of damage sometimes result that relate to drainage, runoff, blasting, slides, etc. Generally speaking, condemnation proceedings include the assessment of all damages that are the natural and probable result of involuntary takings, but the law and appraisal practices relating to such special situations, litigated and negotiated, are far from clear and are not understood by many appraisers. Consequently, the purpose of this research was to carry out a practical and factual analysis of these elements in the interest of enlightenment.

From an examination of all available materials in the subject area, Harrison Lewis et al. prepared discussions of the cases and materials seeming to represent the various legal theories that may be applicable. Many relevant cases were identified, particularly in relation to the drainage and blasting and vibration fields. Although it was not possible to completely analyze all cases from all jurisdictions, an attempt was made to include sufficient citations in the text to enable the brief writer to find those cases that are especially pertinent to his individual jurisdiction. The same is true for the bibliography, which contains considerable material that is not discussed in the main text but may be of particular interest in a particular jurisdiction.

The authors have not attempted editorial or philosophical comment on what the law should be, nor have they proposed changes in the law as such was not a part of their project obligation.

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## ACKNOWLEDGMENTS

The research reported herein was conducted as NCHRP Project 11-1(8) under the general direction of Harrison Lewis, then Deputy Attorney General, State Highway Division, North Carolina Department of Justice, acting as principal investigator. He was responsible for organizing the research, drafting the chapter on "Blasting", and preparing the final report. Mr. Lewis is currently Counsel for the Outdoor Advertising Association of America, Inc.

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Andrew H. McDaniel, Assistant Attorney General, Highway Division, North Carolina Department of Justice (currently Counsel, Carolina Power and Light Company), the research for and drafting of the chapter on "Drainage and Runoff."

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North Carolina State Highway Commission, the basic research in the area of blasting.

Donald M. Jacobs, Trial Attorney, Highway Division, North Carolina Department of Justice (currently District Solicitor, North Carolina Court System), the basic research for and drafting of the chapter on "Landslides" and preparation of the bibliography (Appendix A).

The appraisal comments (Appendix B) were prepared by W. D. Davis (MAI, SREA, ARA, SRA, AACI, ASA, CRE) principal, Appraisal Associates, Kansas City, Mo.

Gratefully acknowledged are editorial comments and suggestions for revisions by Kenneth Wooten, attorney with the firm of Bailey, Dixon and Wooten, Raleigh, N. C., and former Assistant Attorney General in charge of the State Highway Division, North Carolina Department of Justice.

# DAMAGES DUE TO DRAINAGE, RUNOFF, BLASTING, AND SLIDES

## SUMMARY

### *Landslides*

At common law the right of lateral support extended only to the soil in its natural condition, and improvement injury was allowed only when their downward pressure contributed in no way to a landslide. Interference with lateral support was not only compensable at law in a suit in damages, but also enjoined in equity when the interference resulted from a third-party wrongdoer. A public authority was liable in damages in condemnation for interference with lateral support, even in its use of an unopened street.

When liability for slide is predicated upon an excavation, depending on the jurisdiction, the rule allowing recovery varies depending not only on the type of excavation, but also on the type of damage to the remainder, whether it be damage to land, or damage to improvements. Not only are damages from excavation recoverable, but injury from fill material sliding down upon abutting property is also compensable; likewise, damage from tunneling is compensable.

Suits for recovery for injury to lateral support are couched in condemnation, negligence, or nuisance, and the majority view is that the statute of limitations begins to run from the time the slide occurs. The majority view is that with each slide a new cause of action arises.

Generally, the measure of damages is the difference between the before and after market value of property, and the after market value of property is generally determined to be the time of trial. Some courts hold that interference with lateral support is only an item of damages; others hold that the landowner has a substantive cause of action.

However, all courts hold that a landowner must minimize his loss. The landowner has one of the following remedies: Mandatory injunction, writ of prohibition, writ of mandamus, action against a contractor, and inverse condemnation. On the other hand, the condemning authority has the following defenses: *Res judicata*, estoppel, sovereign immunity, and *damnum absque injuria*.

Not only abutting property owners, but also travelers on the highway are protected from landslide. Travelers are protected by the ordinary rules of negligence and liability there depends on whether the circumstances and conditions at the time were such that the danger therefrom was reasonably foreseeable in the exercise of ordinary care, and if so, whether reasonable measures were taken by the responsible agency to prevent injury.

### *Blasting*

Where there is no taking of a portion of land for right-of-way, it must be first determined whether an injury by blasting constitutes a taking or damaging that is compensable under the eminent domain law and constitutional provisions of the particular jurisdiction. Once this has been determined, it appears that the assessment of damages is as in any other condemnation action in the particular jurisdiction.



Where there has been a taking of part of the land for right-of-way, if the damages by blasting are permanent and not mere inconvenience and are a natural and probable result of the taking and use to which the part taken is put, it appears that generally they may be considered in determining the depreciated value of the remainder, although some jurisdictions hold to the contrary on the grounds that other properties have suffered the same damage where no portion was taken for right-of-way.

It appears to be pertinent to determine whether the blasting damage in itself would constitute a taking in determining whether it may be considered in conjunction with acquisition of right-of-way.

Where the damages are due to negligence and there has been a taking of a portion of the land, the jurisdictions appear to be split as to whether the blasting damage may be taken into consideration in determining the after value of the property or whether a separate common-law inverse condemnation must be brought for the blasting damages separately.

### *Drainage and Runoff*

A landowner whose lands are appropriated for highway purposes is entitled to compensation for any damages to his remaining land from the construction of the project over a portion of the same. There must be included all physical injuries resulting from a proper construction of the project which are apparent or should be foreseen.

Damages that could not have been reasonably foreseen at the time of the acquisition by the public authority may be recovered by the landowner when subsequently inflicted. This includes both remainders after an appropriation and tracts of land of which no portion was taken in the construction of the project.

Inverse or reverse condemnation is the remedy of the property owner, and once a taking or damage has been determined, the proceedings take on the aspect of a regular eminent domain proceeding wherein the applicable measure of damages and rules of evidence for the respective jurisdictions would govern.

## CHAPTER ONE

# INTRODUCTION AND RESEARCH APPROACH

The purpose of this report is to provide a relatively concise outline of the current status of the law with regard to damages resulting from drainage, runoff, blasting and slides, with the idea that it may be used as a working tool in the preparation of briefs to be used at the trial or appellate state in litigation involving these elements of damage and particularly in inverse condemnation actions. Because of the number of cases, particularly relating to the drainage, blasting and vibration field, a complete analysis of all cases from all jurisdictions is not possible in the body of the text; however, an attempt has been made to include sufficient citations in the text and bibliography to enable the brief writer to find those cases that are particularly pertinent to

his individual jurisdiction. The researchers have attempted to avoid editorial or philosophical comment with respect to what the law should be and also to avoid proposing changes in the law.

The research approach has been to examine the available material concerning the subject matter, to attempt to select those materials that appear to be most pertinent, and to discuss those cases and materials that seem to represent the various legal theories that may be applicable.

The bibliography (Appendix A) contains considerable material that is not discussed in the text but that may be of particular interest in a particular jurisdiction.

## CHAPTER TWO

## LANDSLIDES

Only in recent times has highway engineering developed to the point where man is able to claw his way through mountains. He is now able to construct routes of predetermined widths through mountains on courses of his own choice, rather than following courses and choosing highway widths dictated by topography. Indeed, the new Interstate Highways breaching the Appalachians and the Rocky Mountains are not only milestones in highway engineering, but also wonders of the modern world.

With man's power to cut great gaps into the face of mountains, the specter of massive landslides haunts travelers and abutting property owners all the more. As in most disciplines, man's ability to achieve far outstrips the written documentation of his achievements. Hence, little appears to have been written in article form analyzing for highway lawyers and engineers the legal ramifications of a landslide. This chapter attempts to fill the void.

Basically this analysis circumscribes the limits of the following relationships: (1) An abutting property owner's rights in response to an interference with the lateral support of his property by a public agency in the construction and maintenance of a public way; (2) the invasion of property by sliding material; and (3) a highway traveler's rights in tort against a public agency for injuries sustained from a landslide that resulted in part from the negligent construction or maintenance of a public way. Of course, other relationships involving third-party wrongdoers are touched on when necessary for understanding landslide consequences, but they occupy a distinctly less favored position.

It is fundamental that property owners abutting public highways have two types of rights in those ways. The first type they enjoy in common with the general public; i.e., the rights surrounding travel. Such rights are not proprietary. The others are private in nature, arising from their ownership of land abutting a public way. These private rights vest in an abutter whether or not the public owns the highway right-of-way in fee or otherwise. Such rights are proprietary, but subordinate to the public's right to alter the road. Alteration of a public way affecting an abutter's private rights must generally be accomplished either with the abutter's consent, or upon payment to him of just compensation. One of these private rights is the right to the lateral support of the roadway. (39 C.J.S. *Highways* § 141, pp. 1079-1080; 27 AM. JUR. 2d *Eminent Domain* § 332, p. 159)

## LIABILITY COMMON-LAW RULE

At common law, the rule applicable between individuals was applied to an abutter so that his right of lateral support extended only to the soil in its natural condition. Hence, improvements had no protection from undermining by slide. Only when their downward and lateral pressure in no

way contributed to soil slippage could improvement injury be considered in estimating damages. (26 AM. JUR. 2d *Eminent Domain* § 204, p. 887; *Welsh Manufacturing Co. v. Fitzpatrick*, 61 R.I. 359, 200 A. 981; *Stearns v. Richmond*, 88 Va. 992, 14 S.E. 847; see also Annot., *Liability of Municipality for Injury to Lateral Support in Grading Street*, 7 A.L.R. 806)

At the outset we hold that in this state, if, in the exercise of a privilege to construct or repair a sewer in a public street, a municipality makes excavation herein, it is subject to the same duty not to interfere with the lateral support of land abutting on the street that the law imposes upon adjoining landowners. Between adjacent landowners, the general principle in this regard is that each has an absolute property right to have his land laterally supported by the soil of his neighbor, and if either in excavating on his own premises so disturbs the lateral support of his neighbor's land as to cause it, in its natural state, by the pressure of its own weight, to fall away or slide from its position, the one so excavating is liable. This right of lateral support applies only to the land of the adjacent owners, and does not include the right to have the weight of the building placed upon the land also supported, and when, upon an excavation made on his own land by an adjoining landowner, a building upon the adjacent land by its weight and pressure causes the building itself and the land upon which it stands to sink, then in the absence of negligence the one making the excavation is not liable for injury to the building resulting from its subsidence. (*Prete v. Cray City Treasurer*, 49 R.I. 209, 141 A. 609, 611)

## ABUTTERS' DUTIES

Abutting owners not only have certain rights in the public way, but they also have certain duties toward that way. When a roadway is constructed on adjacent land, an adjoining owner has the duty of supporting the project as completed. 3 NICHOLS, *THE LAW OF EMINENT DOMAIN* § 9.221 [1], p. 291. (Hereinafter referred to as NICHOLS.)

An interference with lateral support by a third-party wrongdoer, whether or not the wrongdoer is an abutter, is enjoined in equity. Some courts have held that such an interference is a nuisance *per se* and injunction will lie irrespective of whether the injury is to soil or buildings. (*Finegan v. Eckerson, et al.*, 27 Misc. 574, 57 N.Y.S. 605)

## LIABILITY IN LOSS OF SUPPORT AND INVASION OF PROPERTY

Reflection will show that an interference with lateral support by a public authority generally occurs within the framework of four fact groupings: (a) Slide in unopened street; (b) slide from excavation in street; (c) slide from a fill; and (d) slide from tunnel construction. The rules governing liability in each fact grouping differ as much as the operative facts composing the groupings.

Generally, a highway department is not liable to an

adjoining property owner in its use of an unopened street. However, where a man-made earth mound slides onto adjoining property, the abutter has a legal cause of action whether his theory of recovery be framed in trespass, nuisance, negligence, or condemnation. (*Kurh et ux. v. City of Seattle*, 15 Wash. 2d 501, 131 P.2d 168)

In condemnation actions for removal of lateral support by excavation, proof of an excavation is necessary before damages therefor can be assessed. (*Miller et al. v. State*, 279 App. Div. 1139, 113 N.Y.S.2d 220) Moreover, some courts hold that where the grading is done wholly within the street right-of-way for the purpose of establishing the original grade of a dedicated street absence negligence, a public authority is not liable for a resulting landslide. (*Best v. Chehalis*, 82 Wash. 601, 144 P. 918)

It has become the settled law in this state that there can be no recovery for the removal of lateral support by a city in making an original grade, where the grading is done wholly within the limits of the street, in the absence of evidence tending to show that the city was negligent in the prosecution of the work. This rule is grounded upon the principle that, in dedicating a street, the dedicator impliedly grants the right to grade it so as to make it usable, and so as to make the surrounding property accessible. (*Schuss v. Chehalis*, 82 Wash. 595, 144 P. 916)

However, where in the grading of a street to original grade some portion of an abutting lot is cut away, causing the lot's surface to slide, such encroachment is a taking and is compensable. (*Fenton v. City of Seattle*, 132 Wash. 194, 231 P. 795)

On the other hand, some courts have held that even injury to lateral support because of excavation wholly within street right-of-way for the purpose of establishing an original grade is a compensable injury. (*Neal v. City of Bluefield*, 105 W.Va. 201, 141 S.E. 779; 29A C.J.S. *Eminent Domain* § 124, p. 494; 26 AM. JUR. 2d *Eminent Domain* § 204, p. 887) But then some courts hold that a condemnor is liable for damage to property only by reason of changing a grade already established. (*City of Van Buren v. Smith*, 175 Ark. 697, 300 S.W. 397; *Kirk v. Pulaski Rd. Imp. Dist. No. 10*, 172 Ark. 1031, 291 S.W. 793; *Red v. Little Rock R. Co.*, 121 Ark. 71, 180 S.W. 220)

Often, before damage to improvements is considered in assessing over-all damages, a landowner must show negligence, malice, or wantonness. Where this common-law doctrine applies, an exception is sometimes made where the buildings were erected before the contiguous land was separated from the remainder.

The doctrine of lateral support is a very old one. It is the right to have land in its natural state supported by adjoining land. It is well settled that insofar as individual owners of land are concerned, the right ordinarily extends only to land in its natural state, not to artificial improvements erected thereon. . . . Before the right can be extended to buildings or other improvements imposed thereon, negligence, malice, or wantonness must be shown . . . with the exception of those instances where the building is erected on the premises before a part of the land contiguous thereto is sold. . . . (*Commonwealth v. Sally*, 384 Pa. 404, 121 A.2d 169)

Then, of course, some jurisdictions follow the opposite of the common-law rule, and some hold that a condemning authority is liable for damage to improvements caused by

establishment of original grade only when owners could not have reasonably anticipated its level, or when a reasonable grade is changed. (*Gohman v. City of St. Bernard*, 111 Ohio St. 726, 146 N.E. 291; *In Re Public Beach, Borough of Queens*, 248 App. Div. 902, 290 N.Y.S. 635; *Belk v. City of Reading*, 580 Ohio App. 476, 16 N.E.2d 779)

In Arkansas, if an abutting owner has improved his property in reference to an original grade, even the subsequent widening of a street within the right-of-way limits destroying support entitles the owner to compensation. (*Reeves v. Bartholomew*, 178 Ark. 1130, 13 S.W.2d 598) Lastly, some courts hold that if injury to lateral support comes from an excavation in a street not made for ordinary street purposes, the abutting owner is entitled to damages.

The construction of a subway in a street is not an ordinary street use, or for street purposes. If the excavation had been made for such purposes, there would be no liability for damages without proof of negligence. As the construction was not an ordinary street use, or for street purposes, plaintiff's rights are not dependent upon proof of negligence, but are governed by the settled doctrine that an abutter, where the excavation in the street is not such a use, is entitled to lateral support for his building, and when such support is taken away, he is entitled to damages, even though there is no proof of negligence in the taking. (*Union Course Holding Corp. v. Tomosetti Construction Co.*, 184 Misc. 382, 52 N.Y.S.2d 19)

Damages resulting from a portion of a fill sliding down on abutting property are recoverable, because such encroachments via landslide constitute a taking. (*Mapes v. Madison County*, 252 Iowa 395, 107 N.W.2d 62; *Clifford v. State*, 20 Wash. 2d 527, 148 P.2d 302) Likewise, injury to property from tunneling is compensable. (*State v. Williams*, 12 Wash. 2d 1, 120 P.2d 496)

Where suit cannot be predicated on condemnation for injury to lateral support, normally a landowner must couch his suit in negligence. Absent negligence he generally has no remedy, although some jurisdictions allow him to proceed on a nuisance theory. (*Amarillo v. Stockton*, 158 Tex. 275, 310 S.W.2d 737; *Island Lime Co. v. Seattle*, 122 Wash. 632, 211 P. 285; 39 AM. JUR. 2d *Highways, Streets and Bridges* § 171, p. 547)

Public work resulting in withdrawal of lateral support does not constitute a taking within our constitutional provision that "no man's property shall be taken by law, without just compensation. . . ."

As a corollary to this rule, in the absence of negligence in planning or constructing the public work resulting in withdrawal of lateral support, the abutting owner has no remedy since the injury is classed as *damnum absque injuria*. This principal is of ancient origin. (*Freigy v. Gargaro Co.*, 223 Ind. 342, 60 N.E.2d 288)

Therefore, in a "negligent" jurisdiction, a highway department is negligent in proceeding with a project without first providing safeguards against slides when that department has knowledge of the affected soil's propensity to slide. (*Lochore v. Seattle*, 98 Wash. 265, 167 P. 918)

## TIME OF TAKING AND STATUTE OF LIMITATIONS

The majority view is that the statute of limitations begins to run from the time the subsidence occurs, rather than from the time support is removed. (*Kropitzer v. City of Portland*, 237 Ore. 157, 390 P.2d 356) Hence, not only does a new cause of action arise with each subsidence, but the statute also runs separately from each. (27 AM. JUR. 2d *Eminent Domain* § 499, p. 455)

## MEASURE OF DAMAGES

The measure of damages in "support" cases is the difference in market value of the property immediately before and after the taking. Generally, "after the taking" means time of trial, because damages from future cave-ins are normally left for future actions. This allows the condemnor the opportunity of taking such action as will arrest future slides. (*Davis v. Seattle*, 134 Wash. 1, 235 P. 4; 27 AM. JUR. 2d *Eminent Domain* § 327, p. 151)

One exception to this general rule is to be noted. Where, after improvements have been made in reference to an unimproved street, the condemnor establishes an unreasonable grade, the measure is: The difference in market value of the improved real estate at a reasonable grade, and at the unreasonable grade so established. (*Gohman v. City of St. Bernard*, 111 Ohio St. 726, 146 N.E. 291)

Some courts hold that injury to lateral support constitutes but one item of damage, similar to an interference with access when changing street grade. According to this view, liability depends on the general question of a condemnor's liability for change of grade. Conversely, some courts hold that no matter what the circumstances are, an interference with support gives rise to a substantive cause of action. (*Oneida v. Hall*, 21 Tenn. App. 70, 105 S.W.2d 121; Annot., Liability of Municipality for Injury to Lateral Support in Grading Street, 7 A.L.R. 806; 30 C.J.S. *Eminent Domain* § 446, p. 608; 4 NICHOLS, § 14.244 [3], p. 615)

## MINIMIZATION OF LOSS

Regardless of whether an interference gives rise to a substantive cause of action or is an element to be considered in assessing damages, almost all jurisdictions hold that a landowner must minimize his loss. Under this rule, an owner generally has an affirmative obligation to do what is reasonably calculated to lessen his damage. Reasonable good faith expenses incurred in minimizing a loss are recoverable. The rule has also allowed recovery of expenditures calculated to determine the cause of landslides as a prelude to the formulation and implementation of a prevention plan.

... [T]he general rule is that an owner whose property is being taken or damaged by a public entity is under a duty to take all reasonable steps available to minimize his loss. ... With apparently the sole exception of Iowa (*Wilson v. Fleming* (1948), 239 Iowa 718, 31 N.W.2d 393, 398-399) the cases are uniform in upholding this requirement. ... As a corollary, it is likewise generally held that expenses which the owner reasonably and in good faith incurs in an effort to minimize his loss are to be taken into account in computing

the "just compensation" awarded to him in a proceeding in eminent domain. (*Albers v. County of Los Angeles*, 42 Cal. Rptr. 89, 398 P.2d 129; 4 NICHOLS, § 14.244 [3], p. 615)

Although minimizing expenses may be equal to the cost of cure, with that exception, they are but part of a claimant's total recovery as charted by the before and after damage rule (*Gohman v. City of St. Bernard*, 111 Ohio St. 726, 146 N.E. 291)

Case results are often determined by the manner in which a condemnor obtained title to a particular right-of-way area. Some courts hold that absent an express grant, a highway department is liable for loss of lateral support when the street area was acquired by acceptance of dedication or gift. Other courts, on the same facts, hold that absent an express reservation of lateral support, the public authority is not liable on the theory of an implied grant. The latter rule has also been applied to cases where the right-of-way was acquired by purchase or condemnation. (*Kropitzer v. City of Portland*, 237 Ore. 157, 390 P.2d 356, and cases, etc., therein cited)

## REMEDIES OF LANDOWNER

Remedies are dictated by objectives. A landowner has these possible remedies: Mandatory injunction, writ of prohibition, writ of mandamus, action against contractor, and inverse condemnation.

A writ of mandamus—a legal remedy—or a mandatory injunction—an equitable remedy—, if such distinctions still have meaning in a jurisdiction, is used to compel the institution of a proceeding for the ascertainment of compensation. Some courts hold that mandamus is the proper or exclusive remedy when by statute the condemning agency has the duty of instituting the condemnation action. To obtain this writ, a petitioner must show: That a taking has occurred; that the taking constitutes a compensable injury; that he is entitled to more than nominal damages; and that he has no other adequate remedy. (Annot., Mandamus to Compel Ascertainment of Compensation for Property Taken or for Injuries Inflicted Under Power of Eminent Domain, 91 A.L.R.2d 984)

Sometimes courts deny mandamus as well as mandatory injunction, reasoning that to grant either would violate the doctrine of sovereign immunity, although other courts allow both as a method of giving full weight to the constitutional provision of just compensation. (Annot., Mandamus to Compel Ascertainment of Compensation for Property Taken or for Injuries Inflicted Under Power of Eminent Domain, 91 A.L.R.2d 984)

A writ of prohibition will lie where a condemning agency attempts to acquire property under a statute that makes inadequate provisions for the payment of compensation. (*Connecticut River R.R. v. County Commissioners*, 127 Mass. 50, 34 Am. R. 338; Annot., Writ of Prohibition, 115 A.L.R. 33, 159 A.L.R. 627)

Underpinning an inverse condemnation action is the theory of absolute liability. (*Kropitzer v. City of Portland*, 237 Ore. 157, 390 P.2d 356; 29A C.J.S. *Eminent Domain* § 121, p. 481) Because landslides reoccur, contrary to the general rule that a plaintiff must recover all damages in one

action, a landowner may recover in successive inverse actions as damages occur. (*Benjamin v. City of Seattle*, 139 Wash. 68, 245 P. 411) This aspect of inverse condemnation tends to encourage public agencies to use due diligence in preventing future slides.

Actions against contractors are sometimes used not only in cases involving unconstitutional takings, but also in cases where contractors have been negligent in the performance of contract plans and specifications. (*Curtis v. Mississippi State Highway Commission*, 195 So. 2d 497)

Thus a contractor or agent lawfully acting in behalf of the principal in making a proposed public improvement is not personally liable if such improvement is made without negligence. (29A C.J.S. *Eminent Domain* § 195, p. 858)

## DEFENSES

A condemning authority's answer to a landowner's remedy is its defense. *Res judicata* is a defense wherein all damages reasonably foreseen at the time of a prior condemnation action are barred in a subsequent action. (*Davis v. City of Seattle*, 134 Wash. 1, 235 P. 4; *Hinckley v. City of Seattle*, 74 Wash. 101, 132 P. 855) Hence, only such damages as neither party had reason to anticipate, or if anticipated were rejected as being speculative or conjectural, are recoverable in a second action.

Where, however, there is a loss that neither party had any reason to anticipate and the possibility of which, if suggested, would have been rejected as speculative and conjectural in the condemnation proceedings, it has been held that such loss may be compensated in damages in a subsequent action. (*Mapes v. Madison County*, 252 Iowa 395, 107 N.W.2d 62)

Reoccurrence of landslide is conjectural. (*Benjamin v. City of Seattle*, 139 Wash. 68, 245 P. 411)

Where a property owner executes a deed releasing a highway department from all liability although some slide damage had already occurred, the department is entitled to the defense of estoppel upon suit for additional damages. In such case, the courts have held that the damage or taking in question was within the contemplation of the parties when the release was executed, and the claim is barred. [*Commonwealth v. McGeorge* (Ky.) 324 S.W.2d 811] Some courts extend this rule to bar damages reasonably expected at the time of release, and also to takings by consent. (*Albers v. County of Los Angeles*, 42 Cal. Rptr. 89, 398 P.2d 129)

At early common law, a subject could not sue the crown without the king's consent. This rule is applicable today in the defense of sovereign immunity. Hence, absent statute or constitutional provision, plaintiffs are sometimes without remedy for governmental wrongs. (Annot., *Mandamus to Compel Ascertainment of Compensation for Property Taken or for Injuries Inflicted Under Power of Eminent Domain*, 91 A.L.R.2d 984)

Finally, a taking of lateral support may be *damnum absque injuria*. Under a constitutional provision that provides "no man's property shall be taken by law, without just compensation . . .," some courts have held that absent negligence the taking of support is not a taking and thus *damnum absque injuria*. Such a constitutional provision should be contrasted with one that provides for "taking or

damages." In the latter provision, a taking of lateral support is held to be within "damaged." (*Kropitzer v. City of Portland*, 237 Ore. 157, 390 P.2d 356; *State v. Williams*, 12 Wash. 2d 1, 120 P.2d 496) In sum, even a constitutional provision may provide a defense.

## LIABILITY TO TRAVELERS

Travelers on a highway are also protected by law from landslide. Where a slide is caused in part by a highway department's negligent construction or maintenance of a road, claims for personal injury or property damage are compensable. (60 C.J.S. *Motor Vehicles* § 187, p. 527) Liability depends, of course, on whether the circumstances and conditions were such that the danger therefrom was reasonably foreseeable in the exercise of ordinary care, and if so, whether reasonable measures were taken by the department to prevent injury. (39 AM. JUR. 2d *Highways* § 539, p. 939)

The fact that a state's right-of-way line does not include that part of an embankment from which a landslide originates does not relieve the state from its duty of affording reasonably safe conditions for travel by the proper construction and maintenance of a roadway. (*Giroux v. State*, 193 Misc. 589, 82 N.Y.S.2d 553) Hence, ownership in fee or otherwise of the adjoining hillside only clarifies the state's duty of protection. As has been seen in another context, proper construction and maintenance, in some circumstances, includes the erection of retaining walls. (*Shaknis v. State*, 251 App. Div. 767, 295 N.Y.S. 663)

Negligence may also be predicated on a highway maintenance crew's failure to inspect a particular section of roadway with a history of slides following, if not during, a heavy rainstorm. (*Shaknis v. State*, 251 App. Div. 767, 295 N.Y.S. 663; *Juliano v. State*, 190 Misc. 180, 71 N.Y.S.2d 474; *Juliano v. State*, 273 App. Div. 936, 77 N.Y.S.2d 826) Indeed, in a slide area, the state cannot escape liability for negligent maintenance by pleading "*vis major*" or "an act of God" where the slide occurred during a hurricane passing up the coast some miles distant. (*Jacobs v. State*, 177 Misc. 70, 29 N.Y.S.2d 924)

Inasmuch as a highway department is not an insurer of the safety of persons using its highways, it need only maintain them in a reasonably safe condition for ordinary travel under ordinary conditions, or such conditions as should reasonably be anticipated. Hence, the failure to build a retaining wall along a steep hillside, coupled with a failure to remove logs and debris from that hillside, does not *ipso facto* constitute negligence in the construction or maintenance of a highway vis-à-vis a motorist injured from a slide, where the wall could not have prevented the landslide, where the debris was so far above the highway that it was no menace, and where the highway department had no notice of the condition. (*Boskovich v. King County*, 188 Wash. 63, 61 P.2d 1299)

Lastly, because the ordinary rules of negligence and contributory negligence apply to an injured motorist's claim, a plaintiff cannot recover if his own negligence causes or contributes as a proximate cause to his injuries. (*Giroux v. State*, 193 Misc. 589, 82 N.Y.S.2d 553)

Landslides, therefore, have far-reaching effects not only from a highway design point of view, but also from a legal point of view. This analysis has attempted to portray how one slide can easily subject a public authority to a multitude of lawsuits not only from abutting owners above and below the highway but also from motorists and their passengers. The liability exposure from such a slide could conceivably reach into the millions of dollars. Hence, in areas predisposed to soil slippage, roadway design must give particular attention to construction techniques and roadway course. Although little has been written in article form about the legal aspects of landslides, one would definitely be in error to conclude that this is a minor aspect of highway law.

### CONCLUSION

At common law the right of lateral support extended only to the soil in its natural condition, and improvement injury was allowed only when their downward pressure contributed in no way to a landslide. Interference with lateral support was not only compensable at law in a suit in damages, but also enjoined in equity when the interference resulted from a third-party wrongdoer. A public authority was liable in damages in condemnation for interference with lateral support, even in its use of an unopened street.

When liability for slide is predicated on an excavation, depending on the jurisdiction, the rule allowing recovery varies not only depending on the type of excavation, but also depending on the type of damage to the remainder, whether it be damage to land or damage to improvements.

Not only are damages from excavation recoverable, but injury from fill material sliding down upon abutting property is also compensable; likewise, damage from tunneling is compensable.

Suits for recovery for injury to lateral support are couched in condemnation, negligence, or nuisance, and the majority view is that the statute of limitations begins to run from the time the slide occurs. With each slide, the majority view is that a new cause of action arises.

Generally, the measure of damages is the difference between the before and after market value of the property, the after market value of the property being generally determined to be the time of trial. Some courts hold that interference with lateral support is only an item of damages; others hold that the landowner has a substantive cause of action.

However, all courts hold that a landowner must minimize his loss. The landowner has one of the following remedies: Mandatory injunction, writ of prohibition, writ of mandamus, action against a contractor, and inverse condemnation. On the other hand, the condemning authority has the following defenses: *Res judicata*, estoppel, sovereign immunity, and *damnum absque injuria*.

Not only abutting property owners, but also travelers on the highway are protected from landslide. Travelers are protected by the ordinary rules of negligence, and liability there depends on whether the circumstances and conditions at the time were such that the danger therefrom was reasonably foreseeable in the exercise of ordinary care, and if so, whether reasonable measures were taken by the responsible agency to prevent injury.

## CHAPTER THREE

# BLASTING

### LIABILITY

The majority rule on liability for blasting appears to be one of absolute liability due to the ultrahazardous nature of the activity.

Blasting is considered intrinsically dangerous; it is an ultrahazardous activity, at least in populated surroundings, or in the vicinity of dwelling places or places of business, since it requires the use of high explosives and since it is impossible to predict with certainty the extent or severity of its consequences. [35 C.J.S. *Explosives* § 8 (a)]

The decided weight of authority supports the view that where one explodes, blasts on his own land and thereby throws rocks, earth, or debris on the premises of his

neighbor, he commits a trespass and is answerable for the damage caused, irrespective of whether the blasting is negligently done. (22 AM. JUR. *Explosions and Explosives* § 53)

Those jurisdictions that do not predicate liability on the ultrahazardous nature of the activity generally base liability on the maintenance of a nuisance or on the theory of trespass. [40 N. C. L. REV. 640 (1962). See *Hay v. Cohoes Co.*, 2 N.Y. 159 (1849) ("Trespass" by rocks and debris); *Federoll v. Harrison Construction Co.*, 362 Pa. 181, 66 A.2d 817 (1949) (Damage caused by concussion only). See generally Annot., 20 A.L.R.2d 1372 (1951), which cites 20 cases in accord with the principle case to the effect that

recovery may be had for concussion damage without proof of negligence]

A leading case is *Guilford Realty & Insurance Co. v. Blyth Brothers Co.*, 260 N.C. 69, 131 S.E.2d 900 (1963). The court held that one conducting blasting operations that produce concussions and vibrations damaging plaintiff's property is absolutely liable, irrespective of negligence.

The court cites with approval a recent South Carolina case—*Wallace v. A. H. Guion & Co.*, 237 S.C. 349, 117 S.E.2d 359 (1960), based on absolute liability for ultrahazardous activity; however, it also discusses the unwarranted distinction asserted by some courts between a trespass by debris thrown on plaintiff's premises and an invasion of his land by concussion and vibration as follows:

2. HARPER AND JAMES, TORTS 812 et seq. § 14.6 contains excellent review of the authorities. The authors advocate the general rule which we follow. We quote briefly from their conclusion: "Blasting operations are dangerous and must pay their own way. . . . The principle of strict or absolute liability for extrahazardous activity thus is the only sound rationalization."

This majority rule of liability without allegation and proof of negligence has been adopted by the AMERICAN LAW INSTITUTE, RESTATEMENT OF TORTS, Vol. 11, § 519, in which it is said in § 520, at page 44, "Blasting is ultrahazardous because high explosives are used and it is impossible to predict with certainty the extent or severity of its consequences." We think that it is the better reasoned rule and, supported as it is by the majority of the courts, we follow it. This requires affirmance of the order under appeal.

There is a conflict of authority as to whether one who, by blasting with powerful explosives, produces severe concussions or vibrations in surrounding earth and air and so materially damages buildings belonging to others is liable, irrespective of negligence on his part. According to one theory, since recovery is permitted for damage done by stones or dirt thrown upon one's premises by the force of an explosion upon adjoining premises, there is no valid reason why recovery should not be permitted for damage resulting to the same property from a concussion or vibration sent through the earth or the air by the same explosion. There is really as much a physical invasion of the property in one case as there is in the other; and the fact that the explosion causes stones or other debris to be thrown upon the land in one case, and in the other only operates by vibrations or concussions through the earth and air, is held to be immaterial. 22 AM. JUR. *Explosions and Explosives* § 54. It is stated in 35 C.J.S. *Explosives* § 8 (a) that this is the rule "more generally adopted." See Annot., *Liability for Property Damaged by Concussion from Blasting*, 20 A.L.R.2d 1372, 1375 et seq.

The following quote from 40 N. C. L. REV. 640 at 647 summarizes the current state of the law as to liability for blasting generally:

The prime question facing the courts of this field concerns the proper basis of liability for harm occasioned by the use of explosives in blasting. Theoretically, there are three theories open to those courts which remain uncommitted on this issue. They are: (1) Recovery should always depend upon proof of negligence or fault; (2) the action should be one of trespass following the common law concept of strict liability for trespass to land; and (3) the defendant should be absolutely liable on the ground that public policy demands that he stand as an insurer of any injury resulting from the operation of an extrahazardous activity.

As a practical matter, it is generally agreed that an action of trespass may be maintained where rocks and debris are

thrown upon the plaintiff's land<sup>1</sup> or against his person<sup>2</sup> by blasting. The majority of jurisdictions,<sup>3</sup> recently joined by South Carolina<sup>4</sup> and West Virginia,<sup>5</sup> also impose liability, irrespective of negligence, when the plaintiff's domain is damaged by concussion waves and ground vibrations.<sup>6</sup> A minority of states,<sup>7</sup> however, require proof of negligence<sup>8</sup> in the latter situation unless a nuisance is shown.<sup>9</sup>

Courts imposing absolute liability rely upon one or all of the following theories: (1) Air waves or ground vibrations constitute trespass;<sup>10</sup> (2) one who carries on an ultrahazardous activity must be held absolutely responsible because of the possibility of risk;<sup>11</sup> (3) one must not use his property so as to injure that of another;<sup>12</sup> (4) these cases fall within the rule of *Rylands v. Fletcher*;<sup>13</sup> or (5) a nuisance is found.<sup>14</sup>

The minority of jurisdictions reply that (1) concussion or vibration damage is merely consequential, less than a physical invasion of the plaintiff's premises, and therefore the action is properly and historically one of trespass on the case as opposed to trespass;<sup>15</sup> (2) one has a right to the fullest reasonable use of his property, and blasting is a lawful and reasonable use;<sup>16</sup> (3) public policy demands proof of negligence.<sup>17</sup>

A further discussion is found in 44 N. C. L. REV., p. 1049.

#### CONSTITUTIONAL PROVISIONS

Whether private liability constitutes a taking when the injury is by a governmental agency in many instances depends on whether the state has a "taking" or "damaging" provision in its constitution.

The following discussion appears in 2 NICHOLS, § 638:

[pp. 442-443] "It is the prevailing and now almost universally accepted doctrine, in the absence of a special provision in the constitution to the contrary, that when a tract of land has been taken by legislative authority for the public use and the devotion of such land to the use for which it was taken injuriously affects neighboring land in a manner that would be actionable at common law if the injury had been committed by a private individual without legislative sanction, but does not substantially oust the owner from the possession of the land or deprive him of all beneficial use thereof, the owner of the injured land is not entitled to compensation under the constitution; for merely damaging property does not necessarily constitute a taking.

"That a use of land which, though causing injury to the neighboring land, would not be actionable at common law,—in other words, a use that would not constitute a private nuisance—is not a taking is universally conceded to be true. When, however, the injury is of a kind which would create liability at common law a more difficult question arises. At first such a case was summarily dismissed with the statement that a public corporation was not liable for 'consequential damages' resulting from the proper execution of a public work. This rule, however, was neither accurate nor precise, for consequential damages may or may not be actionable at common law and may or may not constitute a 'taking.' Unsatisfactory as it was, this rule prevailed without much controversy for many years and owners were not allowed compensation unless their land was taken in the strictest sense."

A principle that seems to underlie what is being discussed is expressed in the same volume of NICHOLS, pp. 445-446, as follows:

"... [S]ome of the most eminent text writers and courts have accepted the doctrine that any use of land in the construction or maintenance of a public improvement under authority of law which would constitute an actionable injury to neighboring land if done without such authority is a taking within the meaning of the constitution. This theory, it seems, was first clearly expounded in 1872 in the case of *Eaton v. Boston, Concord and Montreal Railroad* (51 N.H. 504, 12 Am R. 147), and the decision, remarkable for its strength of logic and clearness of reasoning, attracted and retained the attention of the legal profession throughout the country. The court goes on to argue, however, that the right of a landowner to be free from injury by the unreasonable use of his neighbor's land is property, of which he cannot be deprived without compensation.

"In a strict legal sense land is not "property" but the subject of property . . . . If property in land consists of certain essential rights, and a physical interference with the land substantially subverts one of those rights, such interference "takes" *pro tanto* the owner's "property" . . . . If the right of indefinite user is an essential element of absolute property or complete ownership, whatever physical interference annuls this right takes property although the owner may still have left to him rights in the article of a more circumscribed nature."

"This case was affirmed by an even more elaborate opinion in the same court two years later (*Thompson v. Androscoggin River Improvement Co.*, 54 N.H. 545), and the substance of the principle established by the two cases is that the right to be free from a private nuisance on adjoining land is property, and that when the public takes the adjoining land and erects a nuisance upon it it takes a right which the owner of such land did not have but which was the property of his neighbor.

"[1] Criticism of Doctrine That a 'Damage' May Constitute a 'Taking.'

"The fallacy of the foregoing argument lies in its assumption that the property rights of an individual against other individuals are the same as they are against the public. In respect to all other branches of sovereign power they are admittedly entirely different. It was said in early times 'For the commonwealth a man shall suffer damage,' and that has been the law ever since. Under the police power and for the public benefit restrictions are placed on a private individual's use of his own land which his neighbors could not impose. He has, for example, an absolute right in the absence of statute to maintain a liquor saloon on his premises. If his neighbors should attempt to prevent him by force, the law would protect him in his property right. But if the state prohibits the maintenance of liquor saloons his property right is taken away; nevertheless he is not entitled to compensation. All such rights are held subject to the exercise of the police power, for such was the universal understanding when the constitutional limitations were created. . . . The distinction is well put in an early Pennsylvania case.

"As in man himself, so in man's title to land there are two necessary elements, the individual and the social. Private right and public right, individual property and eminent domain are perfectly consistent elements of the one thing, property in

land. Those who are engaged in a contest for damages to land caused by the construction of public improvements are prone to forget the social element that is involved in all private titles. . . . Individual property is exclusive as against individuals, but not as against society.' "

[p. 456] "[4] Effect of Constitutional Requirement That 'Damage' Be Paid For.

"Cases did, however, occasionally arise in which it was necessary to decide whether a mere damage was a taking, and in such cases the courts divided, as they did on other constitutional questions, those inclined to sustain property rights at the expense of public rights, giving the broader interpretation to the word 'taken.' This interpretation had behind it a strong popular feeling that uncompensated injury to private property by the erection of public works was a gross injustice, and before long many of the states amended their constitutions by specifically providing that property should not be either taken or damaged for the public use without compensation. In such states the question of the significance of 'taken' ceased to be of practical importance. In the years that have passed since this amendment was first adopted in Illinois, many of the other states have added it to their fundamental law. In some of the remaining states, however, it has been proposed and rejected, and in all of the others there has been ample opportunity to adopt it if public sentiment approved it. It is, accordingly, a reasonable inference that, in the states in which the amendment has not been adopted, it is the will of the people to reserve in their hands the right of constructing public improvements without paying the owners of private property for incidental injury thereby caused, whenever they feel that the public necessities require the exercise of such right, so that the question whether that right exists is now no longer considered to be open."

. . . .

[p. 458] "Sec. 6.4—Compensability for Damage or Injury.

"The concept that an owner of property not actually taken for the public use is entitled to compensation did not firmly establish itself until comparatively recent times. Neither under the common law nor under the constitutions of any of the original thirteen states was there any obligation to make compensation for property damaged by a public improvement when none of it was taken. The public improvements which were constructed during the colonial period and during the half century following the revolution were not, as a rule, of such a character as to cause much injury to property no part of which was taken. . . ."

. . . .

[p. 459] "The many new forms of public improvements which began to be constructed before the century was half over, and the rapidly increasing amount of improved property, led to new forms of uncompensated injury. Some courts sought to avert the hardship of the situation by giving an unusually broad interpretation to the constitutional provision which prohibited the taking of property without compensation, but in most jurisdictions the courts felt bound by the established principle that consequential injuries were *damnum absque injuria*. (See



Section 14.1 [1], *infra*.) With the growing tendency to protect the rights of private property, public sentiment finally came to recognize an obligation on the part of the public to recompense an owner who had suffered for the public good, and it is now generally established by either constitutional or statutory provisions wherever the common law prevails that an owner who suffers damage by the construction of a public improvement shall be made whole at the public expense.”

[p. 486] “Section 6.44—‘Damage’ Clause in State Constitutions.

“Except in the extreme northeastern section of the country, the state legislatures showed no sympathy with the concept that there was a moral obligation to compensate an owner of land which had been damaged by the construction of a public improvement, and continued to authorize the exercise of eminent domain, and the use of the public streets, for public improvements of every description without providing any remedy for the landowners other than that which the letter of the constitution required. It was in the rapidly growing city of Chicago that the most serious injuries to property by the construction of public improvements occurred and the attention of the people of that city was focused upon the hardship of the rule by a number of especially striking examples. Finally, in 1870 a constitutional amendment was adopted in Illinois providing that private property should be neither taken *nor damaged* for public use without compensation. This action by Illinois was followed by many of the other states; by West Virginia in 1872, by Arkansas and Pennsylvania in 1874, by Alabama, Missouri and Nebraska in 1875, by Colorado and Texas in 1876, by Georgia in 1877, and by California and Louisiana in 1879. It is now contained in the constitutions of Alabama, Arizona, Arkansas, California, Colorado, Georgia, Illinois, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, Pennsylvania, South Dakota, Texas, Utah, Virginia, Washington, West Virginia, and Wyoming. There is a similar provision in Iowa, applicable, however, only to the change of grade of highways. It has been said that under the constitutional provisions protecting an owner under a ‘taking’ he is guaranteed compensation for any deprivation of *res*, but not of *jus*. It is under the later provisions of the constitution protecting an owner against ‘damage’ that a landowner may claim compensation for the destruction or disturbance of easements of light and air, and of accessibility, or of such other intangible rights as he enjoys in connection with and as incidental to the ownership of the land itself.”

[p. 487] “Section 6.441—Concept of ‘Damages’ in the Constitutional Sense.

“As soon as the constitutional provision requiring compensation when property was damaged for the public use had been adopted, the question of what it meant arose. It was conceded that it did not apply to the personal inconvenience or annoyance of the occupant of the property or to injury to his business, but only to injury to

property. However, the precise kind of injury to property to which it extended has been the subject of much discussion. It was at first contended that the provision applied only to direct physical injury. The change in the constitution was, however, rightly looked upon as intended to be remedial and was given a broad construction, and the contention that it was limited to direct physical injury was uniformly rejected. A more satisfactory definition of damage had to be found.”

[p. 503] “Section 6.4432—Consequential Damages.

“The term ‘consequential damages’ is ambiguous in character and is not truly relevant to any discussion respecting the different classes of damage. In the proper sense of the term all damages must of necessity be consequential since all damage is the consequence of an injurious act. The use of the term introduces an equivocation which is fatal to any hope of a clear settlement of the question. It means both damage which is so remote as not to be actionable, and damage which is actionable. It is used to denote damage which, though actionable, does not follow in point of time upon the doing of the act complained of. It has been characterized as consequential damage to the actionable degree. The distinction seems to be between less and more remote damage and, in the last analysis, seems to be purely a matter of degree.

“The term is generally used with reference to damage to property no part of which is appropriated. Consideration must be given to the compensability of such injuries under the constitutional provision for payment in case of a ‘taking’ only and under the constitutional provisions in case of a ‘taking or damage.’

“[1] Under Provisions for a ‘Taking’ Only.

“Under the provision for ‘taking’ only, ‘consequential’ damages are generally not compensable since such loss is deemed to be *damnum absque injuria*. Thus, an abutter, the value of whose land is impaired or whose easement rights are interfered with, has no right to compensation unless there is a physical invasion of his property which impairs its use although it does not effect a ‘taking’ in the technical sense of the term. Compensation, in such cases, may be required only for a severe interference which is tantamount to a deprivation of the use of enjoyment of property. The principle forms of interference for which compensation has been allowed may be classed as instances of destruction of property or its use, and may be regarded as analogous to the incidental occupation of abutting property such as by flooding, which had been held to amount to a ‘taking’ within the meaning of the constitutional provision.

“[2] Under the Provision for ‘Taking or Damage.’

“Under the constitutional provision which requires the payment of compensation when property is damaged, consequential damages may be recovered. It has been held that by constitutional change liability for consequential damages has been extended. Judicial decisions have gone even further and have held that liability was brought about by such constitutional change where no liability previously existed. In order to recover for such damage it is not a

prerequisite to recover for the claimant to establish either that the public work constitutes a nuisance or that the work was negligently accomplished.

“Under this provision property is damaged when it is made less valuable, less useful, or less desirable, and it is immaterial whether such damage occurs by reason of the construction or the maintenance of the project, so long as it is directly attributable to such causative factor and irrespective of whether or not there has been an actual physical taking of any part of such property. The depreciation in value, however, must be by reason of damage to the land itself or to property rights therein. Personal inconvenience or discomfort to the owner, or interference with the business conducted on the land, is not compensable unless such results are causative factors in the depreciation in the value of the land. Even then, such results are not, strictly speaking, compensable, but are evidence of conditions which adversely affect the value of the land. Although some courts have held that compensability is based upon a right of action at common law, others have held that a factual injury is compensable even though no proceedings in eminent domain are pending.

“A distinction must be drawn, however, between consequential damages to a remainder area where part of a tract is physically appropriated and consequential damages to a tract no part of which is physically appropriated. In the latter case the damage must be peculiar to such land and not be such as is suffered in common with the general public. The sole test in such case is whether the damage complained of is directly attributable to the taking.”

(Footnotes omitted. See cases cited therein.)

#### TORT ACTIONS AND ACTIONS AGAINST CONTRACTOR

Ancillary to the question of liability for a taking under eminent domain are questions of tort liability. Whether a property owner may proceed in a tort theory against a governmental agency would appear to depend on the extent to which sovereign immunity has been waived either by statute or judicially in a particular jurisdiction. An examination of the state of the law in this regard is beyond the scope of this report.

It should be noted that if the property owner elects to bring suit against the contractor there is authority to the effect that the contractor may be liable.

In *Guilford Realty & Insurance Co. v. Blythe Brothers Co.*, *supra*, the defendant undertook to build sewers for a municipality. When the use of explosives in this undertaking allegedly damaged his property, plaintiff brought suit. The contractor argued that the city's immunity extended to it, in that it was exercising a governmental function on behalf of the city. The court stated that arguments as to governmental immunity were inapposite due to the fact that blasting was a nuisance and there is no immunity where a municipality maintains a nuisance. Because the city had no immunity, the defendant could claim no protection. If damages resulting from such a nuisance, however, are regarded as a taking of private

property for public use, just compensation must be paid. The court indicated that the public taking might render the municipality the *only* party liable, and therefore the contractor might escape liability on this theory. *Moore v. Clark*, 235 N.C. 364, 70 S.E.2d 182 (1952), had indicated that a contractor was not liable for the nonnegligent performance of a governmental contract in strict conformity with the government's plans and under the direction of the government's engineers. Whether the defendant might have this defense did not appear from the record, in that the terms of the contract and its execution were not specified.

Most of the cases dealing with blasting damage by a governmental agency or authority having the power of eminent domain deal with the question of whether or not the blasting, vibrations, depositing of rock, etc., constitute a taking and the questions concerning evaluation of the damage have not been extensively treated because it appears that once a taking or damaging has occurred which is compensable the usual rules of before and after apply. Additional cases to the one previously discussed dealing with the right to maintain an action are: *Sullivan v. Commonwealth*, 142 N.E.2d 347 (Mass., 1957); *Moeller v. Multnomah County*, 345 P.2d 813 (Ore., 1959).

*Gossett v. Southern R. Co.*, 115 Tenn. 376, 89 S.W. 737. If blasting is necessary in the construction of a highway, and damage cannot be avoided, the state may inflict it by virtue of its sovereign right, but must respond in damages; the suit to recover such damages arises under the constitutional requirement of just compensation and is not a tort action against the state. (*Great Northern R. Co. v. State*, 102 Wash. 348, 173 P. 40)

*State ex rel. Fejes v. City of Arkon*, 206 N.E.2d 418 (Ohio, 1965) is an original action for a writ of mandamus to compel the city to appropriate petitioner's property on the ground that property had been rendered valueless by the city's activity in the construction of a nearby expressway. The city demurred. The Court of Appeals held that the city was not liable to property owner for damages caused by tremors and vibrations and that no cause of action was stated. The demurrer was sustained and action dismissed.

The opinion written by Hunsicker, J., says:

[p. 420] “The analogy herein with the case of *Crisafi v. City of Cleveland*, 169 Ohio St. 137, 158 N.E.2d 379, is readily apparent with a reading of the third paragraph of the syllabus, which says:

“Where, during the improvement and development of a public park in a municipality, the use of dynamite causes subterranean tremors which damage nearby property, the municipality is not liable in damages to the owner of such property under the municipality's duty imposed by Section 723.01, Revised Code.”

“In that case (as in the instant case) the argument advanced by *Crisafi* was that the damage to his building by the blasting and dynamiting resulted in an appropriation pro tanto of his property for which he was entitled to compensation under Section 19, Article I of the Constitution of Ohio.

“It is our conclusion that no cause of action is stated in the petition in mandamus, and the demurrer must be sustained. . . .”

## DAMAGE BY VIBRATION FROM OTHER SOURCES

A related body of case law exists with regard to vibration damages caused by instrumentalities other than blasting. These fall into the following general categories:

### 1. Pile driver and other heavy equipment.

*Tadin v. New Orleans Public Service*, 226 La. 629, 76 So. 2d 910 (1954) where the court found the proof of proximate causation wanting. The action was for cracks in walls and plaster of a dwelling house allegedly from vibration caused by the use of a 2,200-lb ball to break concrete pavement at a street intersection near the house.

A similar decision was made in *Hearsey v. New Orleans*, 192 So. 148 (La. App., 1940), where the owner of an apartment house was allegedly damaged by defendant's water main laying operation.

On evidence that the defendant in demolishing a patio and breaking up boulders across the street from plaintiff's house used a derrick and clamshell buckets to lift large boulders 16 to 18 ft before dropping them, and that as the boulders fell with a loud bang plaintiff's house vibrated, knickknacks moved, glass prisms fell, and cracks appeared, it was held in *Piontek v. Joseph Perry, Inc.*, 173 N.E.2d 292 (Mass., 1961), that the verdict for plaintiff was justified. The court said that there was no presumption that this was the usual or safe way to carry on such work, and that no expert testimony as to causation was necessary under the circumstances.

Verdict for plaintiff was sustained in *Ockman v. T. L. James & Co.*, 124 So. 2d 778 (La. App., 1960), on evidence that defendant's construction work in front of plaintiff's residence caused such excessive vibrations as to crack the house, the court saying that although the doctrine of *res ipsa loquitur* was not applicable, the evidence sustained the conclusion that defendant used his machine in an improper way.

*Richard County v. Williams*, 137 S.E.2d 343 (Ga., 1964).

*Dussell v. Kaufman Construction Co.*, 398 Pa. 369, 157 A.2d 740, 79 A.L.R.2d 957 (1960).

### 2. Aircraft.

*Batten v. United States*, 306 F.2d 580 (C.C.A. 10, 1962).

### 3. Gunnery and bombing.

*Nunnally v. United States*, 239 F.2d 521 (1956).

An interesting case that discusses the distinction between blasting cases and other types of vibration cases is *Trull v. Carolina-Virginia Well Co.*, 264 N.C. 687, 142 S.E.2d 622 (1965).

A portion of the opinion is as follows:

Plaintiffs insist, however that the failure to prove the specifications of negligence does not entitle defendant to a nonsuit, that liability should be imposed without necessity of showing fault on the part of defendant; i.e., that the rule of absolute and strict liability, applicable in cases involving damage from the use of high explosives, is appropriate to the facts in this case. In short, plaintiffs contend that this case is analogous to a blasting case since they have a common factor, vibrations.

The rule referred to is that one who is lawfully engaged in blasting operations is liable without regard to whether he has been negligent, if by reason of the blasting he caused direct

injury to neighboring property or premises by casting rocks or debris thereon or by concussion or vibrations set in motion by the blasting. This, because "blasting is considered intrinsically dangerous; it is an ultrahazardous activity, at least in populated surroundings, or in the vicinity of dwelling places or places of business, since it requires the use of high explosives and since it is impossible to predict with certainty the extent or severity of its consequences." 35 C.J.S. *Explosives* § 8a, p. 275. This rule—the rule of liability without allegation and proof of negligence—has been adopted in blasting cases by a majority of the courts and was recently applied in this state. *Insurance Co. v. Blythe Brothers Co.*, 260 N.C. 69, 131 S.E.2d 900. Absolute liability is imposed because high explosives are so dangerous that their use ought to be at the user's risk. *Exner v. Sherman Power Construction Co.*, 54 F.2d 510, 80 A.L.R. 686. The law casts the risk of the venture on the person who introduces the peril in the community. Blasting operations are dangerous and should pay their own way. *Wallace v. A.H. Guion & Co.*, 117 S.E.2d 359 (S.C.). The theory upon which blasting cases have been tried and decided in this jurisdiction has varied—probably because of the different theories upon which plaintiffs have proceeded. Actions have been grounded on negligence, trespass, nuisance, and finally the rule of absolute liability. *Insurance Co. v. Blythe Brothers*, *supra*; 40 N. C. L. REV. 640.

Plaintiffs cite no direct authority in support of their contention. In fact, our research has not uncovered any case directly in point with the case at bar. In our opinion the common factor, vibrations, is not sufficient to place the case under consideration in the same category as blasting cases. Machines, motors and instrumentalities which cause vibrations are in such common use in present-day activities and the probability of damage from their use is so variable that the mere fact that all of them cause vibrations is not a reasonable basis for common classification for liability. There are many cases involving damage by vibrations set in motion by instrumentalities other than explosives; e.g., pile drivers, drills, pavement breakers, etc. The overwhelming majority require allegation and proof of negligence. See *Moneier v. Koebig*, 66 S.E.2d 465 (S.C.); *Ted's Master Service, Inc. v. Farina Brothers Co., Inc.*, 178 N.E.2d 268 (Mass.); *Dussell v. Kaufman Construction Co.*, 157 A.2d 740, 79 A.L.R.2d 957 (Pa). For coverage of this subject, with summaries of cases, see "Annot., Vibrations—Property Damage—Liability," 79 A.L.R.2d 979-985.

There are a few exceptions. In Louisiana the rule of absolute and strict liability has been applied in pile-driving cases by reason of a statute prohibiting an owner from doing work on his own land which might cause damage to his neighbor. *Selle v. Kleamenakis*, 112 S.2d 50. The rule has also been applied (in the absence of statute) in pile-driving cases in England and in Connecticut. *Hoare & Co. v. McAlpine*, 1 Ch. 167, 12 BRC 385 (1923); *Caporale v. C.W. Blakeslee & Sons, Inc.*, 175 A.2d 561. In *Caporale* it is said, "to impose liability without fault, certain facts must be present: an instrumentality capable of producing harm; circumstances and conditions in its use which, irrespective of a lawful purpose or due care, involve a risk or probable injury to such a degree that the activity fairly can be said to be intrinsically dangerous to the person or property of others; and a causal relation between the activity and the injury for which damages are claimed. Defendant actor, even where he uses due care, takes a calculated risk which he, and not the innocent injured party, should bear." In each of the cases, *McAlpine* and *Caporale*, the court considers that the causal relation between the activity and the injury was so established, emphasizes the intrinsically dangerous nature of the pile driver and the extensiveness of property damage, and makes the point that the owner of the damaged property was an innocent party. The principle and distinguishing feature of the rule of "liability without fault" is that negligence is not involved, or, rather, that the presence or absence of negligence is immaterial. All that the injured party must show is that the instrumentality is inherently dangerous within the meaning

of the rule and that the activity caused the injury. The law then imposes liability on the actor who has introduced and set in motion the harmful force. Thus, the operation of the instrumentality, though used for a lawful purpose and with due care, becomes a legal wrong, against the harmful effect of which the actor is insurer. The innocent property owner is protected.

Whether this court will extend the rule of absolute and strict liability to vibration cases other than those involving the use of high explosives, is a question that must await another case and another day. Even if we should be inclined to follow *McAlpine* and *Caporale*—the minority view—the rule is not applicable to the facts in the case at bar.

#### DAMAGE AND EVIDENCE

Ordinarily, allowance is made in a condemnation proceeding only for damage that will ensue as a result of the proper and legal construction and operation of the project. Thus, where damage is or will be inflicted as a result of necessary blasting during the course of construction, allowance therefor may be made in the condemnation proceeding.

In such cases, consideration should be given to such fact, but only insofar as it affects market value. See the following cases:

United States—*Cary Brothers v. Morrison*, 129 F. 177, 65 L.R.A. 659.

Maine—*White House v. Androscoggin R. Co.*, 52 Me. 208.

Massachusetts—*Dodge v. Essex County Commissioners*, 3 Met. 380; *Brown v. Providence, etc. R. Co.*, 5 Gray 35.

Vermont—*Sabin v. Vermont Central R. Co.*, 25 Vt. 363.

Colorado—*G. B. & L. R. Co. v. Eagles*, 9 Colo. 544, 13 P. 696.

Georgia—*Georgia Central R. Co. v. Bernstein*, 113 Ga. 175, 38 S.E. 394.

Kentucky—*Louisville, etc. R. Co. v. Benhayo*, 24 Ky. 67, 14 Ky. L. Rptr. 737, 21 S.W. 526.

New York—*Wheeler v. Norton*, 92 App. Div. 368, 86 N.Y.S. 1095.

North Carolina—*Blackwell v. Lynchburg, etc. R. Co.*, 111 N.C. 151, 16 S.E. 12, 17 L.R.A. 729, 32 Am. St. R. 786.

Ohio—*Carman v. Indiana R. Co.*, 4 Ohio St. 399.

Tennessee—*Pate v. Lewisburg, etc. R. Co.*, 810 Civ. App. 335; *Gossett v. Southern R. Co.*, 115 Tenn. 376, 89 S.W. 737, 1 L.R.A. (n.s.) 97, 112 Am. St. R. 846.

Vermont—*Sabin v. Vermont Central R. Co.*, 25 Vt. 363.

Washington—*B. Schade Brewing Co. v. Chicago, etc. R. Co.*, 79 Wash. 651, 140 P. 897.

Mere inconvenience during construction, however, is not an element of damages to be considered in awarding just compensation. *Commonwealth, Department of Highways v. Eubank*, 369 S.W.2d 15 (Ky., 1963) is a condemnation proceeding in which, after the entry of a judgment in favor of condemnee, appellee, the Commonwealth, appealed. From the opinion by Montgomery, J., we find the following:

[pp. 17-18] “Appellees were permitted to ask their witnesses to take into consideration the interference with the use and enjoyment of their property by reason of ‘the construction operation . . . in front of the home and also

alongside of the tract’ and the rock and dust blown into the yard. Appellees relied on *Producers’ Wood Preserving Co. v. Commissioners of Sewerage of Louisville*, 227 Ky. 159, 12 S.W.2d 292, wherein the court, quoting from an earlier case, said:

“In condemnation proceedings landowners should be allowed to show all facts existing before the taking which a seller would adduce in attempting to make a sale and all facts resulting from the taking to which a purchaser would call attention in an effort to beat down the price.”

“This question as to inconvenience seems to have been settled adversely to appellee’s contention. See *Commonwealth, Department of Highways v. Sherrod*, Ky., 367 S.W.2d 844. The factors suggested are not incident to the taking as required by *Producers’ Wood Preserving*, but are incidental to the construction after the taking for which liability would arise only from negligence or a failure to follow contractual specifications. *Hunt-Forbes Construction Co. v. Robinson*, 227 Ky. 138, 12 S.W.2d 303; *Combs v. Codell Construction Co.*, 244 Ky. 772, 52 S.W.2d 719; *Edge v. Hook*, Ky., 303 S.W.2d 310. Testimony as to restoration costs was also inadmissible. *Commonwealth, Department of Highways v. Rankin*, Ky., 346 S.W.2d 714. This case was reversed but one of the main, if not the main, reasons for reversing it was an improper comment of the presiding judge to a witness as he left the stand.”

See also *Arkansas State Highway Commission v. Kesner*, 388 S.W.2d 905 (Ark., 1965).

There is some indication in some jurisdictions that compensation for an involuntary taking or damaging, even in the absence of negligence, is possibly not a proper matter to be considered along with a condemnation action for a portion of the land. In *Highway Commission v. Reynolds Co.*, 272 N.C. 618 at 623, the court stated:

Whether the landowners said “inverse condemnation” action was a proper cross action in the Commission’s condemnation proceeding is not presented. In this connection, see *Charlotte v. Spratt*, *supra* (263 N.C. 656, 140 S.E.2d 341).

The *Reynolds* case was a vibration damage case and also stands for the proposition that the contractor may not be held liable by either the Highway Commission or the landowner for damages in the absence of negligence (no blasting involved).

27 AM. JUR. 2d *Particular Items or Elements of Damage* § 311 appears to sum up in principle the measure of damages by reason of permanent injury due to blasting, vibrations, or invasion of the property by debris. “These direct damages may not, as a rule, exceed the difference between the fair market value of the tract immediately before the taking and the fair market value of the remainder immediately after the taking or as frequently stated by the courts these particular items of injury are not to be allowed as separate items of damage but are merely to be considered in estimating the depreciation in the value of the land.” The latter rule appears to be the majority and is stated in *West Virginia Pulp and Paper Co. v. United States*, 200 F.2d 100. The case involved the storage of highly explosive gasoline on the part taken. The court excluded evidence that storage of this gasoline depreciated the value of the remainder of the tract for industrial purposes and

refused to instruct the jury that it might include this depreciation in its award for damages. The court held:

In this we think there was error. It is well settled that whenever there has been an actual physical taking of a part of a distinct tract of land the compensation to be awarded included not only the market value of that part of the tract appropriated but the damages to the remainder resulting from the taking embracing, of course, injury due to the use to which the part appropriated is to be devoted.

Kentucky appears to permit a separate award for these damages so long as it does not exceed the depreciation. (*Commonwealth v. Gilbert*, 253 S.W.2d 264, 39 A.L.R.2d 205)

## CONCLUSION

Where there is no taking of a portion of the land, it must first be determined whether the injury constitutes a taking or damaging that is compensable under the eminent domain law and constitutional provisions of the particular jurisdiction. Once this has been determined, it appears that the assessment of the damages is as in any other condemnation action in the particular jurisdiction.

Where there has been a taking of a part of the land, if the damages are permanent and not mere inconvenience, and are a natural and probable result of the taking and use to which the part taken is put, it appears that generally they may be considered in determining the depreciated value of the remainder, although some jurisdictions hold to the contrary on the grounds that other properties have suffered the same damage and no portion was taken. It appears to be pertinent to determine whether or not the blasting damage in itself would constitute a taking in determining whether or not it may be considered. Where the damages are due to negligence and there has been a taking of a portion of the land, jurisdictions appear to be split as to whether or not the blasting damage may be taken into consideration in determining the after value of the property or whether a separate common-law inverse condemnation action must be brought for these damages.

<sup>1</sup> E.g., *Asheville Constr. Co. v. Southern Ry.*, 19 F.2d 32 (4th Cir. 1927); *Adams & Sullivan v. Stengel*, 177 Ky. 535, 197 S.W. 974 (1917); *Hay v. Cohoes Co.*, 2 N.Y. 159 (1849). *Contra*, requiring proof of negligence, *Bennett v. Texas-Illinois Gas Pipeline Co.*, 113 F. Supp. 788 (E.D. Ark., 1953); *Cashin v. Northern Pac. Ry.*, 96 Mont. 92, 28 P.2d 862 (1934); *Thompson v. Green Mountain Power Corp.*, 120 Vt. 478, 144 A.2d 786 (1958).

<sup>2</sup> E.g., *Welz v. Manzillo*, 113 Conn. 674, 155 A. 841 (1931); *Sullivan v. Dunham*, 161 N.Y. 290, 55 N.E. 923 (1900); *Wells v. Knight*, 32 R.I. 432, 80 A. 16 (1911). *Contra*, requiring negligence, *Klepsch v. Donald*, 4 Wash. 436, 30 Pac. 991 (1892).

<sup>3</sup> California, Colorado, Connecticut, Georgia, Hawaii, Illinois, Indiana, Iowa, Louisiana, Maryland, Mississippi, Missouri, Nebraska, New Mexico, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Utah, Washington, West Virginia, and Wisconsin.

<sup>4</sup> *Wallace v. A. H. Guion & Co.*, 237 S.C. 349, 117 S.E. 359 (1960), discussed in Note 10 Catholic U. L. REV. 98 (1961). In the only other blasting case in South Carolina, the court found sufficient evidence of negligence to carry the case to the jury. *Harris v. Simon*, 32 S.C. 593, 10 S.E. 1076 (1890). In a later case involving vibration damage caused by pile driving, the court said the *Harris* case apparently required proof of negligence in the blasting cases. *Momeier v. Koebig*, 220 S.C. 124, 129, 66 S.E.2d 465, 467 (1951). The court in *Wallace* said that since the sole concern of the *Harris* appeal was the sufficiency of negligence, the case was distinguishable, no negligence being alleged here, and dismissed the reference to the *Harris* rule in the *Momeier* decision as dictum. 237 S.C. at 355, 177 S.E.2d at 361-62.

<sup>5</sup> *Whitney v. Ralph Myers Contracting Corp.*, 118 S.E.2d 622 (W. Va., 1961). Adoption of the rule of absolute liability by the West Virginia court was largely predetermined by two federal decisions. *Fairfax Inn, Inc. v. Sunnyhill Mining Co.*, 97 F. Supp. 991 (N.D., W. Va., 1951); *Britton v. Harrison Constr. Co.*, 87 F. Supp. 405 (S.D., W. Va., 1948); and earlier state cases containing strong undertones of strict liability. *Wigal v. City of Parkersburg*, 74 W. Va. 25, 81 S.E. 554 (1914); *Weaver Mercantile Co. v. Thurmond*, 68 W. Va. 530, 70 S.E. 126 (1911).

<sup>6</sup> E.g., *Fairfax Inn, Inc. v. Sunnyhill Mining Co.*, *supra* note 5; *Garden of the Gods Village v. Hellman*, 133 Colo. 286, 294 P.2d 597 (1956); *Central Exploration Co. v. Gray*, 219 Miss. 757, 70 So. 2d 33 (1954); *Thigpen v. Skousen & Hise*, 64 N.M. 290, 327 P.2d 802 (1958). See generally Annot., 20 A.L.R.2d 1372 (1951); RESTATEMENT OF TORTS § § 519-20 (1938).

<sup>7</sup> Alabama, Arkansas, Kansas, Kentucky, Maine, Massachusetts, New Hampshire, New Jersey, New York, and Texas.

<sup>8</sup> E.g., *Ledbetter-Johnson v. Hawkins*, 267 Ala. 458, 103 So. 2d 748 (1958); *Cratty v. Samuel Aceto & Co.*, 151 Me. 126, 116 A.2d 623 (1955); *Dalton v. Demos Bros. Gen. Contractors, Inc.*, 334 Mass. 377, 135 N.E.2d 646 (1956); *Booth v. Rome, W. & O. Terminal R.R.*, 140 N.Y. 267, 35 N.E. 592 (1893).

<sup>9</sup> *Central Iron & Coal Co. v. Vandenhuek*, 147 Ala. 546, 41 So. 145 (1906) (rock quarry); *Benton v. Kerman*, 127 N.J.Eq. 434, 13 A.2d 825 (Ct. Ch. 1940) (rock quarry); *Dixon v. New York Trap Rock Corp.*, 293 N.Y. 509, 58 N.E.2d 517 (1944) (rock quarry), *rehearing denied*, 294 N.Y. 654, 60 N.E.2d 385 (1945).

<sup>10</sup> "One [vibration or concussion] is as much a trespass as the other [rock or debris]." *Whitney v. Ralph Myers Contracting Corp.*, 118 S.E.2d 622, 626 (W. Va., 1961). See also *Johnson v. Kansas City Terminal R.R.*, 182 Mo. App. 349, 170 S.E. 456 (1914); *Hickey v. McCabe & Bihler*, 30 R.I. 346, 75 A. 404 (1910).

<sup>11</sup> The theory is that by engaging in the ultrahazardous activity, the defendant necessarily exposes others to danger. A possibility of risk arises from the dangerous character of the enterprise, which the defendant should assume because he has introduced it into the community. *Fairfax Inn, Inc. v. Sunnyhill Mining Co.*, 97 F. Supp. 991 (N.D., W. Va., 1951); *Britton v. Harrison Constr. Co.*, 87 F. Supp. 405 (S.D., W. Va., 1948); *Whitman Hotel Corp. v. Elliott & Watrous Eng'r Co.*, 137 Conn. 562, 79 A.2d 591 (1951). It should be noted, however, that the risk here is not necessarily an unreasonable one giving rise to a likelihood or probability of injury; i.e., negligence. The reasonably prudent man would proceed with the blasting, but stand as an insurer of any consequences resulting from its dangerous nature. EHRENZWEIG, NEGLIGENCE WITHOUT FAULT § 15 (1951); ELDREDGE, MODERN TORT PROBLEMS 40 (1941); 2 HARPER AND JAMES, TORTS, § 14.7 (1956); HOLMES, THE COMMON LAW 154 (1881); RESTATEMENT TORTS § 520 (a), comment a (1938).

The above cases further state the generally accepted idea that even absolute liability must be based upon some foreseeability of harm. See RESTATEMENT OF TORTS § 519 (1938). This foreseeability qualification to absolute liability led Dean Prosser to conclude that the better rule would be to impose absolute liability in urban or densely populated areas and require proof of negligence in rural or relatively uninhabited localities. PROSSER, TORTS § 59 (2d ed. 1955). This is apparently the law in California. See *Alonso v. Hills*, 95 Cal. App. 2d 778, 214 P.2d 50 (Dist. Ct. App., 1950). Several other cases have also discussed this dual concept. See particularly *Boonville Collieries Corp. v. Reynolds*, 163 N.E. 627 (Ind. App. Ct., 1960) (reversing judgment for failure to allege nature of surroundings).

<sup>12</sup> *McGrath v. Basich Bros. Constr. Co.*, 7 Cal. App. 2d 573, 46 P.2d 981 (Dist. Ct. App., 1935); *Louden v. City of Cincinnati*, 90 Ohio St. 144, 106 N.E. 970 (1914); *Wallace v. A. H. Guion & Co.*, 237 S.C. 349, 117 S.E.2d 359 (1960). See also BIGELOW, TORTS § 466 (8th ed. 1907); Annot., 20 A.L.R.2d 1371, 1374 (1951).

<sup>13</sup> "We think that the true rule of law is, that the person who for his own purposes brings on his land and collects and keeps there anything likely to do mischief if it escapes, must keep it in at his peril, and, if he does not do so, is prima facie answerable for all the damage which is the natural consequence of its escape. . . ." *Fletcher v. Rylands*, LR Ex. 265, 279 (1866), *Aff'd*, *Rylands v. Fletcher*, LR 3H.L. 330, 339-40 (1868). The rule has been applied to the explosion of stored combustibles. *Exner v. Sherman Power Constr. Co.*, 54 F.2d 510 (2d Cir., 1931); *Bradford Glycerine Co. v. St. Marys Woolen Mfg. Co.*, 60 Ohio St. 560, 54 N.E. 528 (1899); and to blasting. *Miles v. Forest Rock Granite Co.*, 34 L.T.R. 500 (K.B. 1918); *Britton v. Harrison Constr. Co.*, 87 F. Supp. 405 (S.D. W. Va., 1948); *Colton v. Onderdonk*, 69 Cal. Rptr. 155, 10 Pac. 395 (1886). See PROSSER, "The Principle of Rylands v. Fletcher," in SELECTED TOPICS ON THE LAW OF TORTS 135 (1953).

<sup>14</sup> E.g., *Longtin v. Persell*, 30 Mont., 76 P. 699 (1904); *Beecher v. Dull*, 294 Pa. 17, 143 A. 499 (1928); *Gossett v. Southern Ry.*, 115 Tenn. 376, 89 S.W. 737 (1905).

<sup>15</sup> E.g., *Ledbetter-Johnson v. Hawkins*, 267 Ala. 458, 103 So. 2d 748 (1958); *Dalton v. Demos Bros. Gen. Contractors, Inc.*, 334 Mass. 377, 135 N.E.2d 646 (1956); *Booth v. Rome, W. & O. Terminal R.R.*, 140 N.Y. 267, 35 N.E. 592 (1893). *Contra*, *Exner v. Sherman Power Constr. Co.*, 54 F.2d 510, 514 (2d Cir., 1931); *Whitman Hotel Corp. v. Elliott & Watrous Eng'r Co.*, 137 Conn. 562, 570, 79 A.2d 591, 595 (1951); "The old technical rules of common-law pleading with their finespun distinctions between forms of action no longer obtain." *See also* 2 HARPER AND JAMES, TORTS § 14.7 (1956); PROSSER, TORTS § 59 (2d ed. 1955); RESTATEMENT OF TORTS § 158, comment h (1938).

<sup>16</sup> *Reynolds v. W.H. Hinman Co.*, 145 Me. 343, 75 A.2d 802 (1950); *Booth v. Rome, W. & O. Terminal R.R.*, *supra* note 15. The absolute liability decisions agree with this proposition, but require one who carries on such activities to assume the risk of all consequences resulting therefrom.

<sup>17</sup> E.g., *Booth v. Rome, W. & O. Terminal R.R.*, 140 N.Y. 267, 35 N.E. 592 (1893), reasoning that the rule of strict liability impedes the development and improvement of property. *Contra*, *Whitman Hotel Corp. v. Elliott & Watrous Eng'r Co.*, 137 Conn. 562, 569, 79 A.2d 591, 595 (1951); "Considerations of public policy do not require immunity from liability for damages caused by concussion or vibration any more than from liability for damages caused by flying debris."

## CHAPTER FOUR

# DRAINAGE AND RUNOFF

### REMAINDER DAMAGES CAUSED BY DRAINAGE AND RUNOFF

During highway construction, or shortly thereafter, there can be special types of damages to real property caused by drainage. Generally, all damages that are the natural and probable result of involuntary takings are to be included and assessed in the condemnation proceeding, but the law and the appraisal practice relating to such drainage situation, litigated and negotiated, is far from clear.

Any attorney who has worked with either highway engineers or appraisers on drainage problems has come to know and respect the frustration that these individuals experience in seeking specific legal rules that can be used as guides in their respective work. The work of the engineer generally involves the application of principles such as those found in the rules of mathematics or the physical laws of nature. Specific hydraulic design problems can be and often are solved by the application of developed formulas, such as quantity equals area times rainfall intensity per hour times a coefficient of runoff. Proper application of such a formula does involve judgment factors, but at least there is the beginning of a solution, and problem after problem can be solved by use of a relatively simple rule. The appraiser, in attempting to evaluate and place a money value on drainage damages, does not have even this recourse.

Drainage laws seek to strike a balance between what are often conflicting interests of adjoining property owners. The law recognizes that ownership entitles the purchaser to make certain reasonable uses of his land without liability, even though it may affect his neighbor's land. Certain other uses, however, may be held to be an unreasonable interference entitling the injured party generally to an abatement of the interference and damages. With increased highway construction, drainage problems are on the increase and promise to become even more numerous and vexatious.

Where an interference with drainage is by a governmental agency having the power of eminent domain, such as a State Highway Department or Commission, different rules and remedies generally apply. In the majority of states, liability for interference with waters arises from the action being classified as a taking or damaging under eminent domain. (26 AM. JUR. 2d *Eminent Domain* § 165) In many of these cases, language such as "nuisance," "negligence," and "trespass" are used; however, the action is held generally to be a taking or damages and the remedy is just compensation under the state's eminent domain proceeding. Generally, where the interference would be actionable between private parties, it constitutes a taking or damaging. [*People v. Symons*, 54 Cal. 2d 855, 357 P.2d 451 (1960)] However, it has been held that a public agency may be liable even though there would be no liability between private parties. [*Milhous v. State Highway Department*, 194 S.C. 33, 85 F.2d 852 (1940)] The owner generally is not entitled to injunctive relief or abatement but is entitled to just compensation for the permanent taking of the right to continued interference and the state agency acquires the right to continue the flooding, diversion, ponding, or other interference with the waters. [*Heezen v. Aurora County*, 157 N.W.2d 26 (S.D., 1968)]

Three general observations may be made at this point:

1. The basic laws relating to the liability of governmental entities are undergoing radical changes in many places, with the emphasis on increased governmental liability.

2. Drainage laws also are undergoing change, with the result that older and more specific standards are being replaced by more flexible standards, which tend to depend more on the particular circumstance of the particular case.

3. The laws of drainage and the laws of governmental liability vary greatly from state to state. Thus, what may be proper conclusions regarding liability in one state may not be held to be true in another state.

## INVERSE OR REVERSE CONDEMNATION

Drainage or water rights may be among the types of property impaired by highway construction and resulting damages are the subject of inverse condemnation actions. It often may be anticipated during the land acquisition stage of the project that some drainage or water rights will be impaired, but uncertainty about both the physical consequences of the project and the validity of a possible claim make it most difficult for the highway departments to recognize a "taking" or "damage" to property outside the project.

If the injurious consequences of a highway project go beyond the scope of the land acquisitions or the easements acquired, affected landowners may sue the governmental agency involved to recover compensation. Such "inverse or reverse condemnation" is based on the theory that the governmental action was lawful, not tortious, and that the constitutional demand that just compensation be paid for property taken or damaged for public use be met.

The amount of damages allowed in a proceeding for condemnation of a part of a tract of land for street or road purposes covers all lawful elements of damages, whether direct or consequential, that could reasonably have been foreseen and determined at the time of condemnation. However, damage that could not have been reasonably foreseen at the time of acquisition by the public authority may be recovered by the abutting landowner when subsequently inflicted. [*City of Houston v. Fox*, 429 S.W.2d 201 (Tex., 1968)]

This Texas case involved access rights, and inverse condemnation actions have been the method by which governmental agencies have been forced to recognize liabilities for denial of certain rights, such as access. [*Bacich v. Board of Control*, 23 Cal. 2d 343, 144 P.2d 818 (1943)] Access problems, as compared to drainage problems, due to the construction of a highway embankment are more obvious. When damages occur to property because of drainage problems arising from a highway project, questions of property law arise. At this stage, some determination must be made as to the category of the water involved, because the rules of water law have been applied by the courts to inverse condemnation claims. (*Womar v. City of Long Beach*, 45 Cal. App. 2d 643; 2 NICHOLS, § 6.44[1])

## CLASSIFICATION OF WATERS

Any discussion of water law requires some definition of the basic terms used. The property laws applicable to waters vary, depending on the nature of the waters involved. For these purposes, many jurisdictions divide waters into various broad categories, as follows:

1. *Surface Waters.* Surface waters are those falling on, arising from, and naturally spreading over lands, and produced by rainfall, melted snow, or springs. They continue to be surface waters until, in obedience to the law of gravity, they percolate through the ground or flow vagrantly over the surface of the lands in the well-defined watercourses or streams. (93 C.J.S. *Waters* § 112; 56 AM. JUR. *Waters* § 65).

2. *Watercourses.* The term watercourses is frequently defined as a stream of water flowing in a definite direction

or course in a bed with banks. Stream waters are waters which flow in a watercourse. Streams usually are formed by surface waters getting together in one channel and flowing therein. The waters then lose their character as surface waters and become stream waters. [*Los Angeles Cemetery Association v. City of Los Angeles*, 103 Cal. 461 (1894)]

3. *Flood Waters.* Generally, flood waters are defined as an abnormal flow that is spilled over the banks of a watercourse. Flood waters are distinguished from surface waters by the fact that the former have broken away from a stream, whereas the latter have not yet become a part of the stream. (Annot., 59 A.L.R.2d 429)

## SURFACE WATER RULES

Two major rules of property law have been developed by the courts regarding the disposition of surface waters. One is known as the civil-law rule of natural drainage. The other is the common-law rule, which treats surface waters as a common enemy. Modification of both rules has tended to bring them somewhat closer together, and in some states the original rule has been replaced by a compromise rule known as the reasonable use rule. Detailed background and citations are contained in an excellent law review article by Kenyon and McClure, *Interferences with Surface Waters*, 24 MINN. L. REV. 891 (1940) and in the Annot., *Surface Waters, Drainage, etc.*, 59 A.L.R.2d 429.

The rules are briefly described as follows:

1. *Civil-Law Rule.* The civil-law rule is based on the perpetuation of natural drainage:

As water must flow, and some rule in regard to it must be established where land is held under the artificial titles created by human law, there can clearly be no other rule at once so equitable and so easy of application as that which enforces natural laws. There is no surprise or hardship in this, for each successive owner takes whatever advantages or inconvenience nature has stamped upon his land. [*Gormley v. Sanford*, 52 Ill. 158 (1869)]

The following is a frequently quoted statement of the civil-law rule:

... every landowner must bear the burden of receiving upon his land the surface water naturally falling upon land above it and naturally flowing to it therefrom, and he has the corresponding right to have the surface water naturally falling upon his land or naturally coming upon it, flow freely therefrom upon the lower land adjoining, as it would flow under natural conditions. From these rights and burdens, the principle follows that he has a lawful right to complain of others, who, by interference with natural conditions, caused such surface waters to be discharged in greater quantity or in a different manner upon his land, than would occur under natural conditions. This is the settled law of this state. [*Heier v. Krull*, 160 Cal. 441 (1911)]

The civil-law rule obviously is a strict one and it is only natural that such a rule be modified. Many jurisdictions recognize an exception for urban areas. [93 C.J.S. *Waters* § 114b; *Timmons v. Clayton*, 222 Ark. 327, 259 S.W.2d 501 (1953)]

Application of the civil-law rule involves:

(a) *Damming back water.* The civil-law rule, at least before modification, appears to forbid the lower owner from damming back the natural flow of surface water. [*Turner v. Hopper*, 83 Cal. App. 2d 215, 188 P.2d 257

(1948)] This seems to follow, of course, from the theory that the lower owner must accept the surface water naturally flowing on him. However, it appears that a lower owner has the right to dam back water or artificial drainage that has been unlawfully thrown upon him. [*Hancock v. Stull*, 206 Md. 117, 110 A.2d 522 (1955)] An addition, it has been held that a governmental agency in constructing public improvements might validly exercise police powers to obstruct such flow without making compensation and that the construction of improvements along a stream for the purpose of flood control was within the police power. [*O'Hara v. Los Angeles County Flood Control District*, 19 Cal. 2d 61, 119 P.2d 23 (1941)]

(b) Augmenting natural drainage. The rule appears to be generally that under the civil law natural drainage may be augmented as the rule is now modified. Surface waters may be accelerated and increased in volume so long as no additional areas are tapped from which surface water otherwise would not have flowed. [*Steiger v. City of San Diego*, 163 Cal. App. 2d, 110, 329 P.2d 94 (1958)] The tapping of additional watershed areas is generally referred to as a diversion and is generally prohibited in civil law jurisdictions. (*Steiger v. City of San Diego, supra*) Generally, surface waters may be accelerated but not diverted. [*Braswell v. State Highway Commission*, 250 N.C. 508, 108 S.E.2d 912 (1959)]

(c) Collecting and discharging water. The civil-law rule here appears to be generally consistent with the common-law or common-enemy rule in that a property owner may not artificially collect surface waters and discharge them in mass on the lower owner to the latter's damage. [*Rudker v. Rzegocki*, 132 Conn. 319, 43 A.2d 658 (1945)] In other words, an upper landowner in the proper improvement of his land may, to some extent, augment or concentrate the natural drainage, but he may not gather the surface waters artificially and dump them on the property below to its injury. It has been held that not only the amount of water caused to flow on the lower land, but also the manner of collection and release and the intermittent increase in volume or destructive force or its direction to a more vulnerable point of invasion are important. [*Phillips v. Chesson*, 231 N.C. 566, 58 S.E.2d 343 (1950)]

2. *Common-Law Rule.* Completely opposite of the civil-law rule is the common-law rule, which permits each landowner to fend off surface waters as he sees fit. Under the strict form of this theory, surface waters are regarded as a common enemy which every landowner may fight as he deems best, regardless of the harm he may cause to others. The common-law doctrine in its stated form is clearly a harsh one and was therefore bound to be modified. In most jurisdictions it has been made subject to a limitation that one must use his land so as not to unreasonably or unnecessarily damage the property of others. [93 C.J.S. *Waters* § 114a(3)]

(a) Damming back water. A situation that can arise in highway construction, but which is generally avoided by the installation of adequate culverts, is the construction of a fill so as to dam back and cast on the upper owner surface waters that normally would drain down and cross his land. The common enemy doctrine in its unmodified form authorizes this action without liability. [*Watts v. Evansville*

*NT. C. and N. R. Co.*, 191 Ind. 27, 129 N.E. 315 (1920)] However, under various modifications of the doctrine, the right to dam against surface waters has been substantially limited. It has been held that the casting back or damming of waters must be reasonable and with due regard for the rights of others. [*Haskins v. Felder*, 270 P.2d 960 (Okla., 1954)]

(b) Augmenting natural drainage. Under the common-enemy or common-law doctrine, even as modified, there seems to be little doubt that an owner of upper land acting in the reasonable use of his property and without negligence may augment the flow of surface water to the land below, either by increasing the volume or by changing the mode of flow. [*Callins v. Orange Co.*, 129 Cal. App. 2d 255, 276 P.2d 886 (1954)]

(c) Collecting and discharging water. It appears that in this area the common-enemy and civil-law rules are most alike. A number of common-enemy doctrine jurisdictions or modifications thereof have held that the collection, concentration, and discharge of surface waters on a lower owner is unlawful. [*Ricenbaw v. Karus*, 157 Neb. 723, 61 N.W.2d 350 (1953)]

3. *Reasonable Use Rule.* The problems created by the early attempts at specific rules have led to the adoption in some states of what is known as the reasonable use rule. (Annot., 59 A.L.R.2d 429) Under this rule, the possessor of land incurs liability only when his harmful interference with the flow of surface waters is unreasonable. One state, in adopting this rule, stated it as follows:

In effecting a reasonable use of his land for a legitimate purpose a landowner, acting in good faith, may drain his land of surface waters and cast them as a burden upon the land of another, although such drainage carries with it some waters which otherwise would never have gone that way but would have remained on the land until they were absorbed by the soil or evaporated in the air, if (a) there is a reasonable necessity for such drainage; (b) reasonable care be taken to avoid unnecessary injury to the land receiving the burden; and (c) if the utility or benefit accruing to the land drained reasonably outweighs the gravity of the harm resulting to the land receiving the burden; and (d) if, where practicable it is accomplished by reasonably improving and aiding the normal and natural system of drainage according to its reasonable carrying capacity, or if, in the absence of a practicable natural drain, a reasonable and feasible artificial drainage system is adopted. [*Enderson v. Kelehan*, 226 Minn. 163, 32 N.W.2d 286 (1948)]

## WATERCOURSES

Much of the law regarding stream waters is founded on the common-law maxim that "water runs and ought to run as it is by natural law accustomed to run." [2 FARNHAM, *WATERS* § 475 (1904)] Thus, as a general rule, any interference with the flow of a natural watercourse, to the damage of another, will result in liability. (93 C.J.S. *Waters* § 19) This may involve acceleration, obstruction and detention, diversion of a stream. [*Sherrill v. Highway Commission*, 264 N.C. 643, 142 S.E.2d 653 (1965)]

## FLOOD WATERS

Waters that are broken away from a natural channel of a stream are generally treated as a "common enemy." Some states recognize a distinction between ordinary flood waters



and extraordinary flood waters. (93 C.J.S. *Waters* § 19b) In *Beckley v. Reclamation Board*, 205 Cal. App. 2d 734, the court gave a warning which could affect highway design:

... merely to label waters as "flood waters" does not, as we see it, necessarily give to the state *carte blanche* to dispose of said waters regardless of the reasonableness of methods employed and the quantity of damage which individual landowners may suffer as a result.

## VALUATION APPROACH IN INVERSE CONDEMNATION CASES

### Measure of Damages

Inasmuch as an inverse condemnation action is nothing more than an eminent domain proceeding that has been initiated by a property owner rather than by a public agency, it is governed by the same rules that govern ordinary condemnation cases.

An inverse condemnation action is an eminent domain proceeding initiated by the property owner rather than the condemner. The principles which affect parties' rights in an inverse condemnation suit are the same as those in an eminent domain action. (*Breidert v. Southern Pacific Co.*, 61 Cal.2d 659)

The yardstick used to ascertain the amount of compensation due in an "inverse condemnation" action is precisely the same as that used in the normal condemnation action. (*Federal Oil Co. v. City of Culver City*, 179 Cal. App. 2d)

The usual "before and after" rule and the "value of the part taken plus damages" rule as set forth in the various jurisdictions, and the modifications thereof, and the rules of evidence are applicable to both ordinary and inverse condemnation proceedings. [*Jones v. Hamilton County*, 56 Tenn. App. 258, 405 S.W.2d 775 (1966)]

An action to recover damages for the taking of private property for public use is in the nature of an inverse condemnation proceeding. The same rules of the law apply to the determination of the right to damage and the measure of damage as in a condemnation proceeding. [*Brock v. Highway Commission*, 195 Kan. 361, 404 P.2d 934 (1965)]

5 NICHOLS, § 16.106.

In *Jones v. Hamilton County*, *supra*, the action was for recovery of \$35,000 damage by reason of an alleged change in natural drainage of surface water resulting from the construction of a highway near the property. The jury returned a "verdict of \$1,000, also stipulating that the State be required to alleviate the condition causing the overflow of plaintiffs' lands." The trial court declined to accept the "stipulation" and rendered judgment for \$1,000. On appeal, the Supreme Court of Tennessee said:

The evidence for plaintiff based on a before and after value of the land, fixed the damage for it in excess of \$1,000.00, . . . it is also fairly to be inferred the jury would have rendered a verdict for more than \$1,000.00 except for its assumption that plaintiffs would be protected against further damage from overflow. It is our opinion that the jury should have been instructed to further consider its verdict and to return a verdict based upon the before and after value of the land according to the proof on that question.

Various evidence of detriments to the property may be shown, but, generally, estimates of costs necessary to offset the detriments cannot be shown. [*Harmsen v. Iowa State*

*Highway Commission*, 251 Iowa 1351, 105 N.W.2d 660 (1960); *Kuehl v. State*, 271 N.Y.S.2d 432 (1966)]

### Rights Acquired by Public Agency in Inverse Condemnation Actions

If the works are constructed with due care and skill they are not a nuisance, and the only remedy is one for compensation, and the damages must be recovered once and for all. [ 1 LEWIS, EMINENT DOMAIN § 80 (3d ed.)]

Once a determination is made of a taking and permanent damages are awarded, the right to maintain the drainage or continue the flooding normally is acquired. In *Cereghino v. State*, 230 Ore. 439, 370 P.2d 694 (1962), the court held:

Had the State Highway Commission in the first instance brought an action to condemn an easement for drainage purposes over plaintiffs' land, that being one of the specific powers granted to it, there can be no doubt that it would have been awarded such interest in the land to be affected upon payment of such compensation as might be determined by the court to be just. We can see no reason why the state's rights should be less where the positions of the parties are reversed and an action such as this, sometimes referred to as "inverse condemnation" is brought. The rule in such cases is that the awarding of permanent damages is equivalent to the acquisition of an easement or other interest in the land by condemnation.

30 C.J.S. *Eminent Domain* § 440.

Where "it appears that less than the whole has been taken and is to be paid for, such a right or interest will be deemed to pass as is necessary fairly to effectuate the purpose of the taking. . . ." (*United States v. Cress*, 243, U.S. 316, 37 S. Ct. 380, 61 L. Ed. 746)

### STATUTORY PROVISIONS

A review of the various states' statutes relative to condemnation reveals a trend toward more codification relative to the measure of damages, and liability. The leading jurisdictions in this respect appear to be Wisconsin (Wisconsin Stat., Chap. 32) and Pennsylvania, with its EMINENT DOMAIN CODE OF 1964, wherein it is provided:

1-612. Consequential Damages. All condemnors, including the Commonwealth of Pennsylvania, shall be liable for damages to property abutting the area of an improvement resulting from change of grade of a road or a highway, permanent interference with access thereto, or injury to surface support, whether or not any property is taken.

Under the annotation appears the following:

Although it was not taken by the condemnation, a plaintiff's right to damages for injuries to his property by reason of interference with his access and a flow of water onto it arises when the actual damage was done, and when this occurred after the effective date of this section he is entitled to compensation. [*Belusko v. Com.*, 25 Monroe L. R. 12 (1966)]

### CONCLUSION

A landowner whose lands are appropriated for highway purposes is entitled to compensation for any damages to his remaining land from the construction of the project over a portion of the same. There must be included all physical injuries resulting from a proper construction of the project that are apparent or should be foreseen.

Damages that could not have been reasonably foreseen at the time of the acquisition by the public authority may be recovered by the landowner when subsequently inflicted. This includes both remainders after an appropriation and tracts of land of which no portion was taken in the construction of the project.

Inverse or reverse condemnation is the remedy of the property owner, and once a taking or damage has been determined, the proceedings take on the aspect of a regular eminent domain proceeding wherein the applicable measure of damages and rules of evidence for the respective jurisdictions would govern.

## APPENDIX A

### BIBLIOGRAPHY

#### I. Annotations

Liability of municipality for interfering, in raising grade of street, with flow of surface water from abutting property, 27 A.L.R. 970.

Right of municipality to hasten flow of surface water along mutual drain ways by improvements of street or highway, 36 A.L.R. 1463.

Right to compensation in eminent domain on basis of entire extent of property or complete use ultimately contemplated in excess of present requirements, 75 A.L.R. 855, p. 870.

Constitutionality of statutes relating to surface water, 85 A.L.R. 465.

Liability for damage by concussion from blasting, 92 A.L.R. 741.

Measure and items of compensation or damages for flooding property under the right of eminent domain, 106 A.L.R. 955.

Limitation applicable to action or proceeding by owner for compensation where property is taken in exercise of eminent domain without antecedent condemnation proceeding, 123 A.L.R. 676.

Obstruction or diversion of, or other interference with, flow of surface water as taking or damaging property within constitutional provision against taking or damaging without compensation, 128 A.L.R. 1195.

Damage to private property caused by negligence of governmental agents as "taking," "damage," or "use" for public purposes, in constitutional sense, 2 A.L.R.2d 677.

When statute of limitation commences to run against damage from overflow of land caused by artificial construction or obstruction, 5 A.L.R.2d 302.

Liability, as regards surface waters, for raising surface level of land, 12 A.L.R.2d 1338.

Liability for property damage by concussion from blasting, 20 A.L.R.2d 1372.

Modern status of rules governing interference with drainage of surface waters, 59 A.L.R.2d 421.

Municipality's liability arising from negligence or other

wrongful act in carrying out construction or repair of sewers and drains, 61 A.L.R.2d 874.

Injunction against exercise of power of eminent domain, 93 A.L.R.2d 465.

Valuation at time of original wrongful entry by condemnor or at time of subsequent initiation of condemnation proceedings, 2 A.L.R.3d 1038.

#### II. Encyclopedias

##### *Blasting*

31 AM. JUR. 2d *Explosions and Explosives* § 47, p. 822.

31 AM. JUR. 2d *Explosions and Explosives* § 35, p. 805.

31 AM. JUR. 2d *Explosions and Explosives* § 36, p. 808.

31 AM. JUR. 2d *Explosions and Explosives* § 37, p. 809.

31 AM. JUR. 2d *Explosions and Explosives* § 38, p. 811.

31 AM. JUR. 2d *Explosions and Explosives* § 39, p. 813.

31 AM. JUR. 2d *Explosions and Explosives* § 40, p. 813.

31 AM. JUR. 2d *Explosions and Explosives* § 41, p. 814.

31 AM. JUR. 2d *Explosions and Explosives* § 42, p. 816.

31 AM. JUR. 2d *Explosions and Explosives* § 43, p. 817.

31 AM. JUR. 2d *Explosions and Explosives* § 44, p. 819.

31 AM. JUR. 2d *Explosions and Explosives* § 45, p. 819.

31 AM. JUR. 2d *Explosions and Explosives* § 46, p. 820.

31 AM. JUR. 2d *Explosions and Explosives* § 14, p. 779.

31 AM. JUR. 2d *Explosions and Explosives* § 65, p. 838.

2 C.J.S. *Adjoining Landowners* § 45, p. 39.

11 C.J.S. *Bridges* § 43, p. 1075.

29A C.J.S. *Eminent Domain* § 161, p. 694.

29A C.J.S. *Eminent Domain* § 169, p. 726.

63 C.J.S. *Municipal Corporations* § 1234, p. 975.

66 C.J.S. *Nuisance* § 47, p. 797.

##### *Consequential Damages*

26 AM. JUR. 2d *Eminent Domain* § 162, p. 832.

26 AM. JUR. 2d *Eminent Domain* § 165, p. 837.

26 AM. JUR. 2d *Eminent Domain* § 204, p. 887.

26 AM. JUR. 2d *Eminent Domain* § 345, p. 179.

27 AM. JUR. 2d *Eminent Domain* § 312, p. 130.

27 AM. JUR. 2d *Eminent Domain* § 332, p. 158.

- 27 AM. JUR. 2d *Eminent Domain* § 333, p. 160.  
 27 AM. JUR. 2d *Eminent Domain* § 349, p. 185.  
 27 AM. JUR. 2d *Eminent Domain* § 350, p. 187.  
 27 AM. JUR. 2d *Eminent Domain* § 487, p. 433.  
 39 AM. JUR. 2d *Highways* § 103, p. 483.  
 29A C.J.S. *Eminent Domain* § 111, p. 450.  
 29A C.J.S. *Eminent Domain* § 141, p. 597.  
 29A C.J.S. *Eminent Domain* § 229, p. 1037.

*Injuries from Negligence, Nuisance, or Trespass*

- 27 AM. JUR. 2d *Eminent Domain* § 480, p. 413.  
 27 AM. JUR. 2d *Eminent Domain* § 483, p. 422.  
 29A C.J.S. *Eminent Domain* § 161, p. 694.

*Remedies of Owner*

- 27 AM. JUR. 2d *Eminent Domain* § 478, p. 408.  
 27 AM. JUR. 2d *Eminent Domain* § 479, p. 412.  
 27 AM. JUR. 2d *Eminent Domain* § 480, p. 413.  
 27 AM. JUR. 2d *Eminent Domain* § 481, p. 416.  
 27 AM. JUR. 2d *Eminent Domain* § 482, p. 420.  
 27 AM. JUR. 2d *Eminent Domain* § 483, p. 422.  
 27 AM. JUR. 2d *Eminent Domain* § 484, p. 423.  
 30 C.J.S. *Eminent Domain* § 394, p. 465.  
 30 C.J.S. *Eminent Domain* § 395, p. 467.  
 30 C.J.S. *Eminent Domain* § 396, p. 470.  
 30 C.J.S. *Eminent Domain* § 397, p. 471.  
 30 C.J.S. *Eminent Domain* § 398, p. 474.  
 30 C.J.S. *Eminent Domain* § 399, p. 475.  
 30 C.J.S. *Eminent Domain* § 400, p. 480.

*Waters*

- 26 AM. JUR. 2d *Eminent Domain* § 235, p. 923.  
 39 AM. JUR. 2d *Highways* § 114, p. 492.  
 39 AM. JUR. 2d *Highways* § 115, p. 494.  
 39 AM. JUR. 2d *Highways* § 116, p. 495.  
 39 AM. JUR. 2d *Highways* § 118, p. 497.  
 56 AM. JUR. *Waters* § 341, p. 775.  
 56 AM. JUR. *Waters* § 342, p. 777.  
 56 AM. JUR. *Waters* § 343, p. 780.  
 56 AM. JUR. *Waters* § 345, p. 781.  
 56 AM. JUR. *Waters* § 353, p. 787.  
 56 AM. JUR. *Waters* § 354, p. 787.  
 29A C.J.S. *Eminent Domain* § 107, p. 435.  
 29A C.J.S. *Eminent Domain* § 114, p. 464.  
 29A C.J.S. *Eminent Domain* § 116, p. 470.  
 29A C.J.S. *Eminent Domain* § 117, p. 471.  
 29A C.J.S. *Eminent Domain* § 150, p. 642.  
 29A C.J.S. *Eminent Domain* § 151, p. 644.  
 39 C.J.S. *Highways* § 87, p. 1016.  
 39 C.J.S. *Highways* § 89, p. 1023.  
 39 C.J.S. *Highways* § 92, p. 1028.  
 40 C.J.S. *Highways* § 185, p. 57.

III. Periodicals

- Absolute Liability—Blasting—Concussion Damage*, 10 CATHOLIC U. L. REV. 98 (May 1961).  
 AMERICAN BAR ASSOCIATION, MUNICIPAL LAW SECTION,  
 1959 Report of Committee on Condemnation and

*Condemnation Procedure*. "Consequential Damages," p. 103.

1960 Report. "Consequential Damages," p. 105.

1961 Report. "Consequential Damages," pp. 54 and 61.

1962 Report. "Consequential Damages," p. 65.

1962 Report. "Severance Damages," p. 62.

AMERICAN BAR ASSOCIATION, LOCAL GOVERNMENT SECTION,

1964 Report of Committee on Condemnation and Condemnation Procedure. "A Review of Inverse Condemnations," pp. 50, 56, 62, 63, 64, and 193.

1966 Report. "Condemnation Procedures," p. 181.

1966 Report. "Consequential Damages," p. 79.

1967 Report. "Condemnation Procedure," p. 214.

1967 Report. "Consequential Damages," p. 85.

1967 Report. "Severance Damages," p. 70.

1968 Report. "Consequential Damages," p. 109.

1968 Report. "Inverse Condemnation Action," p. 274.

1968 Report. "Severance Damages," p. 103.

Barrett, R., *The Continuing Evolution of Inverse Condemnation*, HRB SPEC. REP. 76 (1962) p. 94.

Capshaw, T. D., *Liability of an Entity Possessing the Power of Eminent Domain for Consequential Damages*, 14 OKLA. L. REV. 58 (1961).

Corontzos, R., *Compensation for Taking Flowage Easements by Condemnation*, 23 MONTANA L. REV. 212 (1962).

De La Rue, R. W., *Sound and Vibration Disturbance and its Evaluation*, PROC. WASHO (1960) p. 213.

Greenwold, W. I., *Compensation Principles for Direct and Indirect Takings*, 39 N.Y.S.B. J. 113 (1967).

Holloway, J. P., *Claims Laws and Proceedings—Their Importance and Effect on State Highway Programs*, PROC. WASHO (1961) p. 337.

Hommon, S., *Defense of Explosion or Vibration Damage Cases*, 14 DEFENSE L. J. 1 (1965).

Kusch, K. B., *Blasting—Street Liability for Concussion Damage*, 46 KY. L. J. 636 (1958).

Lee, F. C., *Rights and Obligations of Highway Authorities Relating to Drainage of Already Established or New Highways*, PROC. AASHO (1951) p. 3.

*Liability for Damage from Concussion Without Trespass*, 28 BROOKLYN L. REV. 177 (1961).

Lindas, L. I., *Drainage—Inverse Condemnation*, REPORT OF LEGAL AFFAIRS COMMITTEE, AASHO (Oct. 1961).

Maloney, F. E., *Diffused Surface Water: Scourge or Bounty?*, 8 NATURAL RESOURCES J. 72 (1968).

Mandelker, D. R., *A Review of Inverse Condemnation*, HWY. RES. RECORD NO. 54, (1963) p. 26.

Mandelker, D. R., *Inverse Condemnation: The Constitutional Limits of Public Responsibility*, 1966 WISC. L. REV. 3 (1966).

McCormack, W., *A Taking Without an Invasion of Land*, 3RD ANNUAL LEGAL RIGHT-OF-WAY AND

UTILITY SEMINAR (Aug. 30, 31, and Sept. 1, 1966)  
p. 6.

Nejdley, J. A., *Legal Problems in Street and Highway Drainage*, PROC. 14TH CAL. STREET AND HIGHWAY CONF., Univ. of Pacific (Jan. 1962) p. 128.

O'Brien, J. L., *Flood Damage, Proposed Modification of Common Enemy Rule*, 1963 WISC. L. REV. 649 (1963).

Spies, E. G., *Recovery of Consequential Damages in Eminent Domain*, 48 VA. L. REV. 437 (1962).

Thomson, J. E., *Liability for Drainage Damage*, HRB SPEC. REP. 76 (1962) p. 115.

#### IV. Texts

*Jahr* on Eminent Domain (1st ed., 1953).

##### Flooding Land

§ 60, p. 85.

§ 168, p. 271.

##### Remedies

§ 287, p. 437.

§ 288, p. 437.

##### Valuation

§ 169, p. 271.

*Nichols* on Eminent Domain (3rd ed., 1964).

##### Action of Trespass

§ 28.3(1), p. 645.

##### Blasting

2 § 6.31(2), p. 414.

3 § 9.221(4), p. 297.

4 § 14.245, p. 624.

6 § 32.2, p. 857.

##### Consequential Damages

2 § 6.4432, p. 503.

##### Mitigation of Damages

3 § 8.6206, p. 90.

3 § 8.6207, p. 98.

5 § 16.104(1), p. 73.

##### Negligence and Tortious Injuries

2 § 6.41(1), p. 460.

2 § 6.42(6), p. 478.

4 § 14.1(1), p. 476.

4 § 14.21(1), p. 514.

4 § 14.232(1), p. 554.

4 § 14.245, p. 624.

4 § 14.245(1), p. 626.

4 § 14.2462, p. 643.

6 § 28.311, p. 668.

##### Owner's Remedies

6 § 28.11, p. 590.

6 § 28.31, p. 664.

6 § 28.311, p. 668.

##### Remainder Damage

4 § 14.2, p. 499.

4 § 14.21, p. 511.

4 § 14.24, p. 555.

5 § 16.101, p. 5.

##### Surface Waters and Drainage

2 § 5.7913(1), p. 238.

2 § 6.11, p. 377.

2 § 6.23(2), p. 401.

2 § 6.23(3), p. 401.

2 § 6.42(7), p. 480.

2 § 6.441(2), p. 492.

2 § 6.4431, p. 500.

2 § 6.4441(11), p. 531.

2 § 6.4441(2), p. 538.

2 § 6.446, p. 607.

2 § 7.32, p. 675.

2 § 7.6223(1), p. 862.

3 § 9.221, p. 287.

3 § 9.221(2), p. 291.

4 § 14.244(1), p. 614.

5 § 16.1013(3), p. 36.

5 § 16.1013(4), p. 41.

5 § 16.104(1), p. 73.

5 § 16.104(2), p. 76.

*Orgel* on Valuations Under Eminent Domain (2d ed., 1953).

##### Blasting

1 § 34, p. 164.

1 § 63, p. 288.

##### Consequential Damages

1 § 14, p. 75.

1 § 37, p. 174.

1 § 39, p. 181.

1 § 47, p. 231, N. 7.

1 § 47, p. 232, N. 9.

1 § 53, p. 246.

1 § 54, p. 253.

1 § 359, p. 268, N. 78.

1 § 63, p. 217.

1 § 64, p. 300.

1 § 65, p. 300.

1 § 76, p. 331.

1 § 78, p. 334.

1 § 80, p. 339.

1 § 108, p. 367, N. 19.

1 § 109, p. 374, N. 31.

1 § 110, p. 466, N. 20.

1 § 111, p. 476, N. 36.

## APPENDIX B

### APPRAISAL COMMENTS \*

#### LANDSLIDES

In "support" cases the measure of damages is the difference in the market value of the property immediately before and immediately after the taking. In many jurisdictions the time of the acquisition is the time of the trial. In valuing the remainder after the acquisition, only those cave-ins that have occurred, or that would be considered by a prudent purchaser as likely to occur, may be considered. Damages from future cave-ins are normally left for future actions. Further, the landowner must do what is reasonable to lessen his damage.

The valuation of the property before the acquisition is handled in the usual manner, using the cost approach, the earnings approach, and the market data approach. The values indicated by each of these approaches are correlated to arrive at a final estimate of market value before any part of the property is acquired. It is in the valuation of the property remaining after the acquisition that the difficult valuation problem exists.

If a slide has occurred prior to the taking date, the appraiser is faced not only with the problem of estimating the loss in value due to the slide that has already occurred, but also with the problem of judging the probability of additional slides occurring. It seems fairly obvious that in the original design of the project sufficient right-of-way should have been included to protect any of the remaining property from being subject to this type of loss. That a slide did occur affecting the remainder property demonstrates that the original design was inadequate. Therefore, the problem is one of judging not only the effect on market value of the slide that has already occurred, but also the effect on market value of the probability that other slides may occur.

The problem is more difficult when no slides have occurred. If the design is standard for the soil condition, it is quite probable that prudent prospective purchasers of the remainder property will not give consideration to the possibility of slides occurring. Thus, sales of similar properties can serve as a dependable guide to the after value.

In the use of the cost approach after the acquisition, the area already lost due to the slide is generally considered to have little or no contributory value. The value contributed by the remainder land immediately adjacent to the slide area becomes a comparable sales problem. Search should be made for sales of similar tracts that have been affected by slides. If such sales can be found, the diminution of market value indicated by comparing the sale property with similar property that has recently been sold and is affected by the possibility of slides is an excellent guide. The only difficulty is that such properties are rarely saleable unless they constitute only a small part of a much larger property. Thus, the proper utilization of such data, if available, requires a careful analysis of the sale of both the property

affected by a slide and the property not affected by a slide. However, when such data are available they serve as an excellent indication of the diminution of the value of the remaining land due to the possibility of future slides.

In the earnings approach there is rarely any difference in the typical income and expense that would be anticipated by a prudent purchaser. The difference is one of risk. Thus, the appraiser may well reflect an increased risk due to the probability of future slides providing the analysis of sales of similar properties indicates a higher risk.

In using the market data approach as a guide to the value of the remaining property, the appraiser is again faced with the problem of finding sales of similar properties. The fact that this may be both difficult and expensive only makes it more important that every effort be made to find such data. Then when actual sales are found, the comparison of the sale with the remaining property in the usual manner demonstrates its value subject to the risk of future slides.

The values indicated by each of the three approaches are then correlated into a final estimate of the market value of the subject tract subject to the possibility of future slides. The difference of this market value estimate and the estimated market value of the entire tract before the acquisition clearly demonstrates the total amount of and all of the damages due to the acquisition. This includes not only the loss in value due to the area acquired but also the loss in value of the remaining tract due to the slides that have occurred and due to the risk of future slides. The deduction of the actual contributory value of the land acquired at the price contributed before the acquisition from the total amount of the damages leaves the net amount of the damages due to severance.

#### BLASTING AND OTHER DAMAGES DUE TO VIBRATION

The first problem in an appraisal of this type has to do with whether or not the blasting, vibrations, etc., constitute a taking. If a taking occurs, the usual rules of the before and after valuation apply. However, consideration should be given only insofar as the blasting or vibration affects market value. Further, the acquiring agency is liable for any damages done by blasting without regard to negligence. On the other hand, losses due to vibration generally must be considered to be negligence before they are compensable. Care must be exercised to be certain that inconvenience during construction is not considered. Only those damages that a prudent purchaser will anticipate will ensue as a result of the proper and legal construction and operation of the project may be considered.

In estimating the value before the acquisition, normal valuation procedures apply. That is, values are estimated by the use of the cost approach, the earnings approach, and the market data approach. The final value estimate is arrived at by the correlation of these three approaches.

The best indication of the value contributed by the remainder is sales of similar remainders where it is known

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that blasting will be required in the construction on the area acquired. A prudent appraiser will discount the price paid by an amount that he feels is sufficient to cover the risk of damage from the blasting that he is certain will occur as a result of the proper and legal construction of the project. Such a purchaser will, in all probability, give little or no consideration to any loss in value that may occur as a result of negligence either in blasting or in vibration because it is understood that any damages arising as a result of negligence can be recovered for in a different proceeding from the condemnation proceeding.

It is probable that any remainder sale that can be found will be a larger parcel, only a part of which may be affected by blasting. Thus, it is essential to carefully analyze the sale by comparing the area that may be affected by blasting with similar areas of other sales that will not be affected by blasting. Such an analysis will demonstrate the diminution value due to the anticipated blasting in connection with the public improvement.

In the cost approach, as it is applied to the remaining land, the diminution in value indicated by the sale can be applied directly to the affected area of the subject property. The other land not affected will probably be considered to contribute the same amount as before the acquisition.

In the earnings approach there is a possibility of some reduction in gross income because of the inability to utilize the area that will probably be affected by the blasting. If the area that will probably be affected by the blasting can be utilized, it is possible that a greater risk may be considered in the capitalization rate. The risk indicated, however, should be no more than the risk that is indicated by the capitalization rate developed in the analysis of the sales of similar property.

The comparison of sales of similar properties subject to the effects of probable future blasting with the property being appraised should be handled in a normal manner in the market data approach. In comparing the entire sale property with the entire remainder property, consideration will be given to the similarities and dissimilarities and the value indicated by this comparison is the value indicated by the market data approach.

The correlation of the value indicated by the three approaches then develops the value after the acquisition. The difference between the market value after the acquisition and the market value before the acquisition is the total amount of and all of the damages due to the acquisition. The difference between the total damages and the value contributed before the acquisition by the land acquired will leave the damages due to severance.

#### **REMAINDER DAMAGES CAUSED BY DRAINAGE AND RUNOFF**

The damages caused by drainage and runoff must include all physical injuries resulting from a proper construction of the project that are apparent or should be foreseen. However, damages that cannot have been reasonably foreseen at the time of the acquisition may be recovered for when subsequently inflicted. The damages that actually have occurred can best be measured by the difference in the market value immediately before and immediately after the acquisition.

The value of the entire property immediately before the acquisition is handled in the usual manner, using all three valuation approaches. Then by the process of correlation the final market value estimate before the acquisition is made.

In the cost approach after the acquisition the first problem is one of finding sales of properties similarly affected by drainage and runoff. The comparison of such sales to similar tracts of land that are not subject to drainage and runoff damages develops the diminution in value as a result of this possible damage. This relationship applied to that portion of the subject remainder affected by the drainage and the runoff will indicate the contribution of the land so affected to the value of the entire property.

In the earnings approach, the land subject to drainage and runoff is in most cases unable to produce an income. Under such circumstances the loss in value is clearly indicated by a diminution in the gross income. If the probable loss is an intermittent one, the risk of the occurrence of such a loss may be best reflected in the capitalization rate used. When this procedure is followed, the capitalization rate used must be the rate indicated by the analysis of sales of property similarly affected.

The market data approach again consists of comparing the subject remainder property with sales of entire properties that are similarly affected. This comparison is handled in the normal way and the value indicated is the value indicated by the market data approach.

The value developed by the correlation of the values indicated by each of the approaches is the market value estimate of the remaining property. The difference between this value and the value before the acquisition is the total amount of and all of the damages due to the acquisition. Deduction of the value contributed by the land acquired from the total amount of the damages leaves the amount of the damages due to severance. This is a loss in value as a result of the damage caused by drainage and runoff and is in addition to the loss in value due to the area acquired.

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