INDEX to DOCUMENTATION

RELEVANT TO COMMISSIONERS' INFORMATION REQUESTS DURING THE PUBLIC HEARING

At the June 11, 2014 hearing, the County Commissioners asked for more information during the public testimony and at the conclusion of the hearing. Recognizing the large volume of testimony and submissions, this index is provided as an aid to staff in documenting factual and published data responsive to the Commissioners' questions.

The Index was created to allow easy navigation to desired materials. Clicking on any blue underlined text in the document will bring you to the material referenced.

The Index is organized around the questions posed at the hearing. A list of the questions addressed in the Index is found on p. 3.

Clicking on any of the questions will bring you to a table citing relevant references and source material to address that question. Clicking on any blue underlined text within those tables will either bring you to the attached source material or link you directly to the source online.

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press Ctrl + Home on your keyboard to return to this cover page.

FORMAT OF THIS INDEX

<u>Each question from the BCC Hearing is underlined</u>.
The list of questions (next page) can be clicked to go directly to a specific question.

- **Responsive factual published documents** are listed below each question.
- "**Submittal Item**" column: refers by page number to documents submitted to the record:

CRDC packet	package for CDRC March 20th
BCC packet	package for BCC June 11th
doc@CDRC	document submitted at CDRC hearing, March 20
doc@BCC	document submitted at BCC hearing, June 11
CDRC transcript	transcript of hearing
BCC transcript	transcript of hearing
App-CDRC	document originally submitted by applicant (in CDRC packet)
APP-modified	recalculations by applicant for BCC hearing; numbering per BCC packet
Real Estate Ad	Online commercial real estate ad, CB Richard Ellis. Key pages are attached. This material can be directly accessed at http://www.cbre.us/o/albuquerque/properties/la-bajada. However, some of the web pages seem to have been modified. Excerpts from the application time are shown in Attachment #12.
Land Dev Code	Santa Fe County Land Development Code, 1996
NM Mining Act	New Mexico Mining Act of 1993
Attachment #X	Refers to an Attachment to this Index

- "**Published source**" column: Citations refer to the original source of the published document (books, web page URLs, and County and City reports).

Questions Addressed in this Index

1. Is basalt from applicants' site uniquely superior to other road-base sources?

Relevant document	Submittal Item	Submittal Page	Published Source
Caja del Rio Basalt lab test records, SFSWMA, show that CdR product meets FHWA, NMDOT, City, BIA, and FAA standards for aggregate.	Attachment #1	p. 1	Letter, June 24, 2014, from testing lab Western Technologies Inc, 8395 Washington Pl. NE, Abq 87113-1670.
Average specific gravity of basalt is 2.8 to 3.0	On-line Reference	-	EduMine, Professional Development and Training for Mining and the Geosciences, http://www.edumine.com/xtoolkit/tables/sgtables.htm
Applicant represents LB basalt as having specific gravity of 2.55-2.65 (lower than average).	Attachment #12 from Real Estate web site	p. 1-2	Oct. 10 2003 letter, on Buildology letterhead, signed by Steven A. Hooper P.E. No testing lab cited.
Applicant stated that LB basalt is especially dense (this means high specific gravity) and impermeable.	BCC transcript		During applicant's sworn testimony. (Page number unknown until transcript is posted.)
Evidence regarding the soundness and suitability of LB basalt	Attachment #2	p. 11, item 16	"Gross Receipts Tax and Economic Impact Analysis of proposed Buena Vista - Rockology basalt aggregate operation" by L. Graeser, Chief Economist (ret.), NM Taxation & Revenue Dept (1986-2001) , and NM Dept. of Finance & Admin. (2006-2010); International economic consultant (1998-present), specializing in analysis of tax revenue impacts of economic proposals
La Bajada & Caja del Rio are the same homogenous geological formation.	BCC packet	NBB-1090	Map provided by Dr. Kirt Kempter, geologist and Fullbright Fellow.

2. Can tax and employment benefits be expected from a new mine?

Relevant document	Submittal Item	Submittal Page	Published Source
Expert witness testimony, economics and taxation: Laird Graeser	doc@BCC	-	Laird Graeser, Chief Economist (ret.), NM Taxation & Revenue Dept (1986-2001) , and NM Dept. of Finance & Admin. (2006-2010); International economic consultant (1998-present), specializing in analysis of tax revenue impacts of economic proposals
Gross Receipts & Economic Impact Analysis	doc@BCC, Attachment #2	pp. 1-7	"Gross Receipts Tax and Economic Impact Analysis of proposed Buena Vista - Rockology basalt aggregate operation" by L Graeser, 2014
Exclusion of Caja del Rio basalt production from Applicants' estimates distorts actual production and market data.	Attachment #2	p. 2	(above)
Caja del Rio cost structure makes profitability and tax liability of proposed BV/R mine questionable.	Attachment #2	pp. 3-5	(above)
Applicants estimate 50% of sales GRT taxable; historically, Caja del Rio sees between 3% and 10% taxable sales.	Attachment #2	p. 5	(above)
Existing in-county suppliers, including CdR, have existing stockpiles sufficient for over 10 years' demand, and capacity to expand production.	Attachment #2	p. 6	(above)
Applicants' job projections of 7 full-time workers with benefits, plus 6 contract truckers, does not match production (projected BV/R, or actual CdR)	Attachment #2	p. 7	(above)

3. What conflicts exist between State and County mining definitions, and within County codes?

Relevant document	Submittal	Submittal Page	Published Source
LDC is internally inconsistent on applicability: Art III, section 5.1.1, Applicability, does not exempt gravel; but Art III, 5.1.2.D states that none of Article III applies to sand and gravel.	Land Dev Code (LDC)	III.5.1.1 & III.5.1.2.D	Santa Fe County Land Development Code, 1996
LDC is ambiguous in defining sand, gravel, etc. Art. III definitions, esp. that of "mineral," have been referenced to Art. XI	Land Dev Code	III.5.2	Santa Fe County Land Development Code, 1996
Art XI was written to exempt the gravel industry from nearly all zoning and environmental regulations applicable to every other residential or commercial or industrial land-user, and applied to gravel when under Art. III. This violates the clear intentions of the Code as a whole.	Land Dev Code	Art. III , Sec A.3 through A.7	LDC Art III.5 (mining) requirements include a multi-disciplinary review board, BCC-set limits on volume or duration of operation, review of past performance by operator at any site worldwide, and compliance with all State and Federal permits.
Article XI exempts sand and gravel from every part of the LDC except Article XI: XI.1.7.2 "Except as provided in this Ordinance, mining uses shall not be subject to the Code." XI.1.1.2 makes any conflicting provision in the LDC "precluded by this Article XI."	Land Dev Code	XI.1.7.2 & XI.1.1.2	Santa Fe County Land Development Code, 1996
County Land-Use Code definitions for "mine site", "mineral", and "mining use" (established in Art X) all specifically apply ONLY to Art XI. However, Art. XI governs sand and gravel exclusively, so these definitions are all self-contradictory.	Land Dev Code	Art X, 1.83 to 1.86	None of these definitions excludes or exempts sand or gravel, and in fact, none even mentions sand or gravel in specific. Yet each definition is clearly stated to apply ONLY to the Article (XI) that governs sand and gravel mining.
Article XI defines extracted construction materials as "stone, sand, gravel, aggregate, and other naturally occurring materials" and excludes them from the Article on Mining (Art IISec5).	Land Dev Code	Art XI, 1.1	Santa Fe County Land Development Code, 1996
NM Mining Act 69-36-3 in defining "mineral" and "mining," excludes sand, gravel, and related soil-like substances.	Attachment #13	69-36-3	New Mexico Mining Act, 1993

4. How does "contested water" (per Rep. Stephanie Garcia-Richards) affect County potable and City effluent supplies?

Relevant document	Submittal	Submittal Page	Published Source
The Board of County Commissioners in Dec 2011 formally requested the City utility to prioritize release of effluent for use in irrigation by La Cienega, Cieneguilla & La Bajada	Dec 13, 2011 BCC minutes; Attachment #3	pp. 25-29	SF BCC Resolution No. 2011-191, A Resolution Requesting that the **City of Santa Fe Release Additional Effluent** into the Santa Fe River **to Support the Historical Agricultural Needs of the Village of La Cieneguilla and The Village of La Bajada** (Introduced by Commissioner Anaya) Resolution approved by unanimous [4-0] voice vote. santafecountynm.gov/documents/agendas/minutes/12-13-11.pdf
City effluent is over-allocated by min. 40%	BCC transcript; Attachment #4	pp. I, 22	*City of Santa Fe Reclaimed Wastewater Resource Plan*, April 2014, pp. I, 22
Code requires rights certified by State Engineer	Land Dev Code	pp. 249-250	Santa Fe County Land Development Code, 1996, Article XI, Zoning for Extraction of Construction Materials, Sec. 1.7, Reviews for Mining Uses
Water rights face adjudication throughout NM; the Santa Fe River system/basin was 74% adjudicated in 2010. "There is no debate that [the Middle Rio Grande, from Cochiti south] is the most significant area of the state where an adjudication suit has yet to be filed."	Attachment #5	p.12	*The Future of Water Adjudications in New Mexico,* GC Ridgely, Office of State Engineer **Especially fig. 2, p 12.** http://wrri.nmsu.edu/publish/watcon/proc55/ridgley.pdf

5. Is the water budget estimate reliable?

Relevant document	Submittal	Submittal Page	Published Source
Water estimate as initially submitted in the application is unsubstantiated. The "Water Budget for Reclamation" section of the application does not actually provide a water budget. Instead, it mentions three phases of reclamation whose surface area is provided in square feet, then provides calculations showing that 270,431 gallons of water will be required to reclaim each acre of land.	App-modified; CDRC packet	p. 19; NBB-31	Cites no methodology, source of data, nor explicit assumptions (e.g. hours of operation)
The three phases described in this Water Budget for Reclamation section total only 592,376 square feet, or 13.6 acres of land. However, Sheet 16 of the Materials Extraction Plans, entitled *Reclamation Plan, Phase III*, shows all 50 acres reclaimed. Since no actual water budget is provided, it is impossible to determine which plan is accurate and what condition the mesa would be left in when mining is complete. Nor do we know whether the process will have consumed 3,677,862 gallons of water (to reclaim 13.6 acres) or 13,521,550 gallons (to reclaim all 50 acres.)	APP-modified	Sheet 16	
Applicants' estimates of water requirements increased by 13,521,550 gal between CDRC and BCC hearings	APP-modified	p.21, NBB-33; Sheet 16	Total additional water quantities not cited, but required gallons per acre for reclamation, partial acreage calculations, and a plan (sheet 16) showing 50 acres of planned reclamation are provided.

6. Is a groundwater discharge permit required?

Relevant document	Submittal	Submittal Page	Published Source
NM Environment Department regulations require Groundwater Discharge Permitting.	Attachment #6		NMED Water Quality Control Commission Regulations, 20.6.2.1201, Environmental Protection: Water Quality – Ground and Surface Water Protection http://www.nmcpr.state.nm.us/nmac/parts/title20/20.006.0002.htm
City of Santa Fe *Reclaimed Water Use Requirements* state unequivocally: "Dispensing of reclaimed water for application to any Area on an **ongoing basis**, rather than temporary or intermittent, **shall require a ground water discharge permit,** pursuant to the New Mexico Water Quality Control Commission Regulation 3104.	BCC packet	NBB-87	*City of Santa Fe, Wastewater Division, Reclaimed Water Use Requirements.* These rules, regulations and requirements are legally attached to the Reclaimed Water Use Agreement and Permit (see page NBB-82), and include the provision that failure to follow these requirements may result in revocation of the agreement to provide effluent.
Applicants' submission (pp. NBB-9 through NBB-146) contains no reference to any Groundwater Discharge Permit.	BCC packet	not found	
County Code requires applicant to provide evidence of planned compliance with laws, rules, regulations and permits.	Land Dev Code		Santa Fe County Land Development Code, 1996, Article XI, Zoning for Extraction of Construction Materials, Sec. 1.7, 2 Environmental Review

7. Does Code require sufficient water for full duration of project?

Relevant document	Submittal	Submittal Page	Published Source
County Land-Use Code, re: gravel extraction. "The applicant shall submit evidence that the applicant has obtained an **adequate** supply as evidenced by appropriate **permits issued by the State Engineer's Office**/ Interstate Stream commission of New Mexico." (Emphasis added. "Adequate" clearly means meeting proposed usage, and strongly implies that usage be met for the full term of the project.)	Land Dev Code	Art. XI	Santa Fe County Land Development Code, 1996, Article XI, Zoning for Extraction of Construction Materials, Sec. 1.7, Reviews for Mining Uses
County Land-Use Code, applicable **ONLY** to community water systems. [where] "existing utility companies are proposed as the source of water supply, the applicant shall submit a water availability assessment which includes… a letter of intent from the utility that they are ready, willing, and **able to supply the maximum annual requirements** for the development. The letter must also state any requirement for the applicant to provide water rights." (Emphasis added. Applicant is not proposing a community water system, but has claimed that a ready-and-willing letter is sufficient evidence for a mining operation.)	Land Dev Code	Article VII, 6.4.4a	Santa Fe County Land Development Code, 1996, Article VII, Environmental Requirements
Neither utility letter (from County or City) meets the requirement to guarantee "to supply the maximum annual requirement for the development." In fact, both utilities state that supply may be curtailed under emergency conditions.	BCC packet	NBB-79 through NBB-88	
The City of Santa Fe is submitting a letter to BCC elaborating on limits to access to effluent water sources. These limits mean that County potable water will be used much more extensively than implied at the BCC hearing.			To be supplied

8. Does the submitted traffic analysis represent standard estimating methods for industrial traffic counts?

Relevant document	Submittal	Submittal Page	Published Source
Applicants' traffic analysis was limited to "rush hour" on a road where there is no rush hour, and where maximum usage is driven by production schedules, not arrival or departure of workers.	App-CDRC; doc@BCC	NBB-34 & NBB-35	Neither in written application nor in sworn testimony did applicant cite any methodology or reason for focus on commuter peak hours.
Standard method(s) must differentiate trucks from other traffic, and consider daily, weekly, and monthly statistics.	Attachment #7		"Evaluation of Different Methods to Calculate Heavy-Truck VMT" University Transportation Centers, US Dept of Transportation MTC Project 2002-02.
Average Daily Traffic must be based on 48-hour count during midweek; minimum, with extrapolation, 24-hour count.	Attachment #8		"2014 Project Traffic Forecasting Manual" Florida Department of Transportation www.dot.state.fl.us/planning/statistics/trafficdata/ptf.pdf

9. Are County facilities such as Caja del Rio ever obligated to obtain County zoning permits?

Relevant document	Submittal	Submittal Page	Published Source
For Caja del Rio, which is a joint agreement between City and County of Santa Fe, landfill permits were obtained by the City. These are State and Federal (EPA) regulations, and are more stringent than State gravel mining permit requirements, especially concerning air and water impacts.	Attachment #2	p. 2	"Gross Receipts Tax and Economic Impact Analysis of proposed Buena Vista - Rockology basalt aggregate operation" by L Graeser, 2014

10. What viewshed analysis methods are standard?

Relevant document	Submittal	Submittal Page	Published Source
Visual impact analysis or viewshed analysis today is primarily automated, using GIS and publicly available digital map data.	doc@BCC Attachment #9	p. 1	" Viewshed Mapping and Visual Impact Analysis" D. van Doren, 2014
Visual impact from Camino Real was evaluated by Rick Wessel, NMDOT archaeologist, based on National Elevation Dataset.	doc@BCC	pp. 3-4	(above)
Visual impact from five locations along I-25 (not evaluated by Applicant) were evaluated using transect analysis and public data, by Van Doren.	doc@BCC	pp. 6-7	(above)

11. From what locations have visual analysis been mapped? What other viewpoints need to be mapped concerning this mining application?

Relevant document	Submittal	Submittal Page	Published Source
Viewpoints submitted by applicants/staff were limited to two on I-25 on either side of the Waldo interchange, and others on Waldo road close to the interstate.	App-CDRC	NBB-132 to NBB-141	Field photos of 3-foot wide flags on 20-foot poles representing mine location
Wessel documented views from the Juana Lopez segment of the Camino Real de Tierra Adentro passing close to the proposed mine.	doc@BCC Attachment #9	p. 3-4	"Viewshed Mapping and Visual Impact Analysis" D. van Doren, 2014
Transect analysis by van Doren covered 5 sites on I-25; see location map.	doc@BCC	p. 6	(above)
Other viewpoints of concern include locations on the Turquoise Trail National Scenic Byway (NM 14), NM 22 and NM 57A, and Cerro Chato Road. This is not a comprehensive list.	doc@BCC	p. 5	(above)
No viewshed analysis was conducted from locations south and east of the proposed mining zone. However, photographs from some of these locations show that the entire proposed operations will be visible, not hidden in an extraction pit. Because of the slope of the land, the Application diagrams show that the "pit" has no sides to the south. This fact is also shown in the elevation diagrams in the application.	App-CDRC, doc@BCC Attachment #9	pp. 6-7	"Views of Proposed Mine Site from Five Locations Along I-25"

12. What is the history of land ownership and real estate transactions for this site?

Relevant document	Submittal	Submittal Page	Published Source
pre-1970s sale by John Simms to Ernest Cummins	doc@BCC		Santa Fe Reporter, May 18 1978, page 1- 15
Sept. 9, 1975 'round-robin' sales between Naumburg, Cummins, and Peppler increased value 400%	doc@BCC; Attachment #10		Santa Fe Reporter, May 18 1978, page 3 "*From $300 to $1200 per Acre in One Day*"
1978 Consent Decree against Cummins, Naumburg, and Peppler			District Court Case # SF 78-2566, Toney Anaya vs. Ernest Cummins. Several decisions handed down Dec 20 1978; Oct 3, 1979: Required restitution of $475,000 to investors.
1980 transfer from Cummins to Buena Vista. J. Geist is mentioned as an investor in BV, but Naumburg is conspicuously absent at the time of this transfer. As of 2014, he is a major (if not the major) owner in BV.	App-CDRC	NBB-38 to NBB-53	District Court ruling on restitution escrow required by consent decree, above, ruling May 26, 1980. Because the escrow for restitution was not funded, Cummins was allowed to give the land to newly formed Buena Vista to ensure funding for restitution.
Buena Vista Inc. was required under the terms of the District Court ruling to abide by State and County laws concerning development.	App-CDRC	NBB-46 (orig p. 10, sec. 13)	"Buena Vista Estates Inc intends to develop [the land surrendered by Cummins] but will comply with the New Mexico Subdivision Act 70-5-1 et seq NMSA and the Santa Fe County Subdivision Regulations prior to subdivision or sale of said land."

13. Where is this property listed as "5200 acres of aggregate for mining"

Relevant document	Submittal	Submittal Page	Published Source
International real estate ad for "5200 acres of rich aggregate for possible mining."	doc@CDRC and doc@BCC; Attachment #12	p. 3	http://www.cbre.us/o/albuquerque/properties/la-bajada First posted ca. 2007; most recent update July 2014.

14. Are application documents correct and complete?

Relevant document	Submittal	Submittal Page	Published Source
Coefficient of Runoff "CN" for existing soil is unrealistically high (82%).	Application plan drawings: NBB-90 to NBB-106	Sheet 9	Transportation Department standards for NM and five other states show max. CN for vegetated soil at 60% (10-year storm); max for soil in 100-year storm, 75%
Coefficient of Runoff "CN" for exposed basalt unrealistically low (84%).	Application plan drawings	Sheet 9	Applicant testimony (BCC) states basalt at this site is highly impervious (impervious surfaces CN = 90-95%)
Resulting calculation estimates only 2% increase in runoff from soil to solid impervious rock.	Application plan drawings	Sheet 9	
Recalculation using soil CN = 75% and basalt CN = 95% results in retaining pond undersized by rough factor of 2 (31K cf versus 54K cf).	Attachment #11		Spreadsheet table "**Recalculation of BV/R Runoff using more realistic coefficients**"
Contours at pond cross each other (contours can never cross)	Application plan drawings	Sheet 9	Impossible to ascertain whether pond size as drawn matches mathematical estimate.
18-inch silt fence used for dust control (ineffective and non-standard specification)	Application plan drawings	Sheet 11	Zigzag line on plan; detail "Silt fence Installation" clearly indicates use for filtering runoff, not dust)
Topsoil stockpiles are extremely large: drawn at approx. 300 x 175 ft (Phase I) and 200 x 50 (Ph. 2+3I). Topsoil amounts are not proportional to pile sizes: 17,000 c.y. (Ph. 1), 11,000 c.y (Ph.2), and 6,000 c.y. (Ph 3).	Application plan drawings	Sheets 9,12,15	Per plans: **Phase 1:** 17,000 cu. yds; plan footprint = 300 x 175 ft. (5833 sq. yds base area). If uniform height, this would be 9 feet tall, but as a cone, much taller. **Ph.2:** 11,000 c.y. on 200x50 ft (1,111 sq. yd) If uniform height, 30 ft tall; actually much taller. **Ph.3.:** 6,000 c.y. on 200x50 ft (1,111 sq. yd.). If uniform height, 16 ft tall; actually much taller.
Industry standards indicate that soil stockpiles taller than 4 to 6 ft or held for more than one month result in dead soil organisms; soil is no longer viable, and will disperse as dust.	Standard sources listed		P. Craul, *Urban Soil in Landscape design,* 1992,Wiley, p. 290-91; *Sustainable Landscape Construction*, 2nd Ed. 2007, Island Press; page 88-89.
"Area to be reseeded" (shaded on applicants' plans) is completely inconsistent with volume of topsoil stockpiled per phase.	Application plan drawings	Sheets 10, 13, 16	**Phase 1:** 17,000 c.y. over area of less than 20,000 sq. yds. (shaded on plan)= ***2.5 ft* depth of topsoil**. **Ph.2:** 11,000 c.y. over area est. 21,000 sq. yds = ***1.5 ft* depth of topsoil**. **Ph. 3:** 6,000 c.y. over area 134,000 sq. yds. = about ***1.5 INCHES* topsoil depth** - *insufficient to sustain vegetation, especially over bedrock.*

NPDES general permit requires "areas inactive for more than 14 days be temporarily stabilized, unless construction will resume within 21 days." **No such temporary stabilization is indicated** on plans, yet applicant has testified that quarry will be inactive for months within the proposed 25-year operation.	Application plan sheets	Sheet 18 re-produces text of NPDES regulation	For details of the NPDES **(National Pollution Discharge Elimination System)** see http://cfpub.epa.gov/npdes/. NPDES applies to all projects disturbing one acre or more. BV/ R drawings reference a superseded version of the NPDES regulations.
Code requirement to provide evidence of planned compliance with laws, rules, regulations and permits	Not provided		Santa Fe County Land Development Code, 1996, Article XI, Zoning for Extraction of Construction Materials, Sec. 1.7, 2 Environmental Review
Reclamation acreages inconsistent throughout application	App-modified	p.21, NBB-33; Sheet 16	The partial acreage listed is incorrectly calculated and also inconsistent with the 50 acre reclamation plan shown on Sheet 16.

ATTACHMENTS

Attachment #1: Letter affirming repeated AASHTO testing of Caja del rio aggregate meeting NMDOT and all other agency standards for base course and other uses

Western Technologies Inc.
The Quality People
Since 1955

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Albuquerque, New Mexico 87113-1670
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June 24, 2014

To Whom It May Concern

RE: Delhur Industries - Caja Del Rio Aggregate Pit - Santa Fe, New Mexico

Western Technologies Inc. is an accredited ***AMRL*** laboratory by the American Association of State Highway and Transportation Officials (AASHTO) doing business in the greater Albuquerque area since 1984. We have provided quality control and materials acceptance reports on many of the products produced out of the Caja Del Rio Pit for many years. As such, we can attest that the materials produced out of the pit have been tested and acceptable by many agencies that specify aggregates for highway, bridge, and building materials. We have tested and produced reports for the following agencies:

- New Mexico Department of Transportation (NMDOT)
- Bureau of Indian Affairs(BIA)
- Federal Highway Administration(FHWA)
- City of Santa Fe Public Works
- Private Contractors and subcontractors.
- Federal Aviation Administration (FAA)

The aggregate pit is a basalt flow crushed material that meets the aggregate index required by the NMDOT for concrete, asphalt, and base course materials. In addition, the aggregates meet the durability requirements of the FHWA section 703, for concrete, asphalt, base course, and RIP RAP materials. The coarse aggregates have been used for concrete on Santa Fe Public Works projects for years and meet all requirements of ASTM C-33.

Respectfully Stated,

WESTERN TECHNOLOGIES INC.

Andrew L. Cuaderes, SR. - Managing Director/Vice President

Attachment #2: Gross Receipts Tax and Economic Impact Analysis

Gross Receipts Tax and Economic Impact Analysis
of proposed Buena Vista - Rockology basalt aggregate operation

Executive Summary of Testimony and Analysis by Laird Graeser

Chief Economist (ret.), NM Taxation & Revenue Dept (1986-2001)
and NM Dept. of Finance & Admin. (2006-2010)
International economic consultant (1998-present)
specializing in analysis of tax revenue impacts of economic proposals

Sworn testimony provided at June 11, 2014 BCC hearing, Santa Fe NM

- The application by Buena Vista/Rockology (hereafter, BV/R or Applicant) claims that creating a new mining zone and permitting it to blast, crush and sell basalt aggregate would have economic benefits including tax revenue increases for Santa Fe County. Analysis shows these claims to be dubious.
- The BV/R application contains a number of misstatements due to completely excluding the amounts of basalt produced and sold by the Caja del Rio quarry (hereafter CdR). Excluding CdR quantities makes it appear that there is less existing basalt production in Santa Fe County than in fact is produced, and that therefore a profitable market could exist for new production. Analysis that includes CdR shows that there is no shortage of suitable construction aggregates in the mid-County area.
- The BV/R application claims that aggregate from CdR and other existing in-County producers is inferior to what applicant proposes to produce, allegedly giving the proposed mine a market advantage. However, CdR's product has repeatedly been tested and shown to meet the standards of NMDOT, FHWA, BIA, and City and County of Santa Fe (see Attachment #1, letter from Western Technologies lab, June 24, 2014). CdR aggregate is widely accepted and used for base course, construction, ready-mix, and landscaping purposes. Analysis does not support claims of higher quality, or advantageous marketability based on such claims.
- The cost structure of CdR Rock Quarry, operated by Del Hur Industries, allows it a competitive advantage compared to the BV/R proposal and to other existing producers. If BV/R must lower prices to compete, their profitability, and thus economic benefits and tax liability to the County, would be questionable.
- Because production currently fulfills and meets demand, even if BV/R captures part of the market, it will be at the expense of "cannibalization" of existing operations, including CdR. If existing operations lose profits and/or workers, the potential impacts on the County's economy and tax base are negative, especially since BV/R is headquartered outside the County.

Understatement of Production and Overstatement of Market

There is a substantial market throughout Santa Fe County for aggregate of all grades, but the market is currently satisfied by production within the County. Applicants' exclusion of production by CdR distorts the actual relationship between supply and demand.

- Caja del Rio produces aggregate as a adjunct to blasting that creates pit space for its main purpose, as the regional landfill. Sale of basalt removed from the pits recovers something approaching half of the costs of blasting, a significant saving to County taxpayers for whom the landfill is operated. CdR aggregate production is operated by Del Hur Industries.
- Aggregate production at CdR is governed under its landfill permit (with stricter air and water protections than are usual for gravel mine permits), and as such is not reported to the NM Department of Energy, Minerals and Natural Resources, which permits and tracks ordinary gravel operations.
- Hereafter, gravel operations that obtain their permits from and report production and sales statistics to the NM EMNRD are referred to as "State gravel-permitted" operations. Other legal production comes from "adjunct-permitted" operations, whose permits allow gravel production secondary to a main purpose, such as landfill at CdR; and from "temporary permit" operations, usually specific to borrow pits for road construction. Neither adjunct nor temporary production should be thought of as operating without any permit.
- By relying on EMNRD statistics on gravel production only from state gravel-permitted operations, the applicant has understated actual production for Santa Fe County and overstated potential markets by 50,000 to 160,000 tons. This under/overstatement also distorts the Applicant's estimates of costs, sales, and margins.

The following chart shows the recent volume and value of aggregate for Santa Fe County as reported to NM EMNRD, 2008-2012. Production by Caja del Rio is not included by EMNRD in their statistics. However, Caja del Rio currently has a stockpile of 1.6 million tons of basalt extracted from the landfill cells that can readily be processed into gravel.

Note that even without the CdR production, there was an excess supply of aggregate in the County for the period reported. This excess is much larger when CdR production and sales are properly accounted for.

Existing Aggregate Production/ Sales/ $Value - Santa Fe County NM EMNRD statistics 2008-2012 (as reported by operators)				
AggregateType	**Amount Sold**	**Amount Produced**	**Production Value**	**Price per Ton**
	Short Tons	*Short Tons*	*$*	*$/Short Ton*
Base Course Total	516,283	550,797	$10,585,457	$19.22
Crushed Rock Total	79,595	80,626	$249,800	$3.10
Gravel Total	348,262	420,973	$11,364,937	$27.00
Riprap Total	65,778	65,778	$1,217,715	$18.51
Totals - existing production	**1,009,918**	**1,118,174**	**$23,417,909**	
Average Total Annual	201,984	223,635	$4,683,582	
Excess Supply Annual		**21,651**		
Caja del Rio aggregate (annual)		250,000 to		
***not* included in EMNRD stats**		500,000		
ACTUAL EXCESS SUPPLY FOR ALL EXISTING COUNTY AGGREGATE (ANNUAL)		271,651 (min) 521, 651 (max)		

Note: NM EMNRD statistics for fill dirt production have been excluded from this chart. For SF County during the above years, the pattern of supply slightly exceeding demand held for fill dirt as well as gravel products.

Cost Structure, Profitability, and Impacts to Taxpayers

The cost structure of the CdR operation allows a competitive advantage compared to existing aggregate producers and to the proposed BV/R mine. CdR blasts and excavates basalt to create landfill cavities. This excavated basalt is stockpiled, ready for crushing and screening. This stockpile is currently 1.6 million tons. Del Hur pays the Agency $1.50 per ton for the excavated basalt. This includes a fair-market payment of $0.95 per ton to BLM, owners of rights to minerals including the basalt. Thus, the County nets $0.55 per ton for re-purposing what would otherwise be a waste byproduct of the landfill operations.

Concurrently, Del Hur realizes a cost advantage over other mining operations. The cost of blasting and excavating prior to crushing is estimated at $2.87 per ton. Because Del Hur pays only $1.50 per ton, they have a $1.37 per ton cost advantage.

Current prices of gravel products produced under NM-EMNRD permits in Santa Fe County (previous chart) range from $18 to $27, except the significantly smaller and cheaper crushed rock.

The following chart shows current prices for comparable products from the Del Hur operations at Caja del Rio.

Caja Del Rio Quarry Rock Sales Price List		
	Freight on Board (FOB)	Delivered
ROCK TYPE	PRICE PER TON	PRICE PER TON
¾" minus – driveway base	$5.95	$10.95
¾" NMDOT type 1 base	$7.45	$12.95
Chips* -- (#57, 67, 7, 8, ¾")	$8.95	$13.95
3/8" minus – crushed fines	$8.95	$13.95
Rip rap	$15.00	$20.00
¾" minus – general fill	$3.75	$8.95

Note that CdR price for NMDOT type 1 base and chips (used for concrete and asphalt manufacture, and comprising the bulk of CdR's contract sales) average $8.20. This is approximately 10% lower than the $9 per ton estimated by BV/R for proposed production.

Based on their incorrect assumption that the County market is under-supplied, Applicants have argued that delivery from sources outside the County was significant in driving up local prices. (From the BV/R application: "*Reduced cost of materials: The location will reduce transportation costs for aggregate from Albuquerque sources by an estimated $4-$5/ton.* ") This is based on the assumption that it is necessary to deliver from Albuquerque (which is where Rockology is based). However, CdR delivers at $5 per ton, exactly the amount used by BV/R in its own estimates.

Thus, while BV/R might be able to undercut the prices of NM-EMNRD-permitted operations in mid-Santa Fe County, it is unlikely that the proposed mine could undercut the CdR operation. Only by cutting prices below production costs could the operators of the proposed La Bajada mine develop a market for their product. Since this is not a sound business model, it suggests that the application to rezone the property for mining may not be directed at actual mining, but at manipulating the price of the Applicant's holdings in the area.

As noted earlier, in a market that is already adequately supplied, a new operation would result in cannibalization of profits, Gross Receipts tax revenues, and jobs, which would merely move from existing locally-owner businesses to Albuquerque-based BV/R.

In addition to these cannibalization effects, analysis suggests two other negative fiscal impacts are likely:

Any production at the proposed mine on La Bajada that displaces sales from the Caja del Rio operation will cost the citizens of Santa Fe County (landfill users and taxpayers) $0.55 per ton of base course, chips or crushed rock. Any displaced sales would also cost the BLM nearly $1 per ton.

Thus, County residents, as citizen taxpayers of both of the County and the US, will sustain an economic loss of $1.50 for every ton of aggregate produced by the proposed mine. Given the Applicant's assumption of 250,000 tons per year over 25 years, and assuming that all BV/R sales displace CdR sales, these losses would total $375,000 annually, and $9,375,000 over the next quarter century.

Gross Receipts Tax impact

Applicant assumes 250,000 tons/year sales at an average of $9 per ton. Gross revenue is calculated as $2,250,000 per year; costs of production, deductible form other types of tax rates but not from GRT, are not accounted for. Haulage (at $5/ton, identical to CdR's actual haul rate) is added to the applicants' calculations, giving a claimed annual total for material and haulage of $3,500,000. Analysis (above) shows that BV/R's assumptions about ease of capturing market in the County are overstated, which would mean that the applicants' revenue estimates would also be unreliable.

The applicants' claims of economic benefits also include the assumption that 50% of the product + haulage would be non-taxable. The Director of CdR, by contrast, states that historically only about 10% of CdR gravel sales have been taxable, and that this is going to decrease to 3% in the near future because of a large new contract. Further, the applicants' calculations imply that the County receives 100% of any GRT collected. In fact approximately 75% of GRT revenue goes to the State, and only 25% benefits the County directly.

Gross Receipts Tax for the kinds of aggregate likely to be sold from the proposed operations is charged at point of use, not at the mine location. Therefore, any sales outside of Santa Fe County would generate no GRT for the County. In sworn testimony, the Applicant has stated that they consider the La Bajada site optimal because of access to I-25 and the ability to serve markets to the South (Albuquerque and beyond) and North (Las Vegas, Raton, and beyond). If, as this analysis concludes, profitable entry into the Santa Fe market may not be easy, a business strategy of selling in, for instance, the Albuquerque market may be what the Applicants are relying on. Given Rockology's existing sales facility in Albuquerque, it seems very likely that

much or all of the product of a La Bajada mine would be sold and taxed in Albuquerque, not Santa Fe County. In the extreme case, this could result in no additional GRT for the County.

Even if the proposed mine's products were to be sold in Santa Fe County, there would be no increase in GRT. The taxes are collected where the aggregate is used irrespective of what mine produces the material. Therefore GRT would be generated because of the project, not because of this new mine.

The net result of these corrections to the applicants' estimates is that there will be little, if any, increase in GRT.

Future Capacity

The capacity of the CdR operation to provide gravel and base course from its existing stockpile (estimated by director Mr. Kippenbrock at 1.6 million tons) and from future expansion is on the order of 250,000 to 500,000 tons per year, even if no additional landfill cells are excavated. An additional 125,000 tons per year for at least four years is expected to be generated by the most recent new cell, 5B.

Applicant has stated that each US citizen uses 22,000 pounds (11 tons) of gravel per year. New Mexico EMNRD statistics for Santa Fe County, 2008-2012, show a similar rate of consumption: 10 tons per person per year. Applicant also states that, as a national average, building a new modern home uses 400 tons of aggregate.

The Santa Fe County Sustainable Growth Management Plan predicts 12,195 homes to be built between 2010 and 2030. The bulk of these (9,425) are expected to be built in the El Centro and Galisteo areas in the middle of the county. Given widespread and pro-active "green building" in Santa Fe, it might be predicted that homes here would use less than the 400 tons national average. Even assuming that each house requires 400 tons, and that the projections for new construction are accurate, the average annual demand for aggregate for residential construction will be about 189,000 tons for the central portions of the county. Existing sources, including Caja del Rio, can more than meet this demand for many years to come even without expansion of the CdR facility. Given that growth in residential numbers generates increased need for landfill space, expansion of Caja del Rio's primary purpose should generate additional basalt as an adjunct to landfill, continuing the cost-saving re-use of excavated material and the resulting cost competitiveness of CdR products.

Future demand appears likely to be reduced by trends in construction material recycling. The use of recycled concrete as a substitute for "virgin" aggregate, as well as use of recycled glass aggregate, and in-situ recycling of asphalt (which effectively recycles the aggregate already contained in the original asphalt) are all gaining acceptance among engineers and builders, and

are increasingly cost-effective options. Many such recycled products drastically cut the cost of transportation, which makes them increasingly viable as fuel costs rise. Thus, such options must be considered as likely increasing competition for any gravel operation, and especially for one that relies on energy-intensive blasting and crushing.

Jobs

Applicant states that it anticipates "*7 full-time employees at average wages of $40,000 + benefits*." In addition, Applicant states they would hire "*6 independent haulers at average hourly rate of $75/hour*."

However, the Caja del Rio Del Hur operation has only one permanent employee, plus four members of a crusher operations crew that moves around among three or four del-Hur operated quarries as needed to meet demand for product. Typically, the crew conducts operations at Caja del Rio about three times per year, crushing enough to fill anticipated orders. For the near future, this involves about 80 hours work per year for the four person crew, producing approximately 160,000 tons.

BV/R has, in sworn testimony, pictured their operation as on-again-off-again, as demand requires, and that this is typical of the gravel industry as a whole. These arguments have usually been presented in the context of attempting to downplay concerns about constant noise, dust, or traffic. However, they appear quite inconsistent with claims that seven people will be employed full-time, plus truckers, to produce 250,000 tons per year. Assuming the use of 500 ton per hour equipment, this annual production would require crusher operations only 50% to 60% of the working year, plus blasting which the Applicant has repeatedly characterized as infrequent.

Employment estimates are not binding upon an applicant. There are many ways in which total actual employment could be reduced below the threshold that differentiates full-time from part-time. These include failure to capture market, reduced demand (whether from slow construction or from increased sustainable practices and alternative materials), and logistical changes in hours of operation. If any of these occur, some or all of the staff would be reclassified as part-time workers, and would not receive the benefits asserted in the application. This would substantially reduce the value of the claimed job creation, both to individual workers, and indirectly to the economy and tax base of the County.

White Paper –

Factual Background on the Caja del Rio Landfill

and associated crushed basalt gravel operation

Prepared by Laird Graeser

Based on comprehensive interview (Thursday, June 26, 2014) with Randall Kippenbrock, P.E., Director of the Caja Del Rio landfill

and on a legal analysis document prepared by Holland and Hart for SFSWMA (Aug. 4, 2010), supplied by Randall Kippenbrock, P.E.

1. The Santa Fe Solid Waste Management Agency (SFSWMA or Agency), a joint authority of the City of Santa Fe and Santa Fe County, was created in 1995. The purpose of SFSWMA was to create, maintain and operate a modern, fully EPA-certified landfill[1] for use by residents of the City of Santa Fe and Santa Fe County. The old landfill located on the site of the current Buckman Road Recycling and Transfer Station, was at the end of its useful life. Under the initial joint agreement, the City was tasked with obtaining the necessary landfill permits and the County with obtaining the real property for the new landfill. SFSWMA began operations at the new Caja del Rio landfill in 1997.
2. The original plan for Caja del Rio called for soil cover from each disposal cell to be removed and stored for use in the daily, intermediate and final covers of compacted solid waste. The basalt bedrock was to be blasted into lumps that could be excavated with heavy equipment, loaded into heavy mining dump trucks and transported to a storage waste (tailings) pile located next to

[1] http://www.sfswma.org/about-us/caja-del-rio/cell-5b-construction/
The requirements and technology for modern landfills is both complicated and expensive. The webpage cited includes the following description of elements required for Cell 5B.
"*The Caja Del Rio Landfill is continuing the construction of its next solid waste disposal cell, Cell 5B. A total of 25 successful blast events occurred from October 7, 2013, to February 21, 2014. The blasting and excavation of 279,000 cubic yards of basalt rock is complete. The subgrade soil will be prepared for the installation of a geosynthetic liner. The liner is a low permeable barrier which is constructed under the landfill before disposal to contain leachate and prevent groundwater contamination. The liner system includes a layer of a low-permeability, geosynthetic clay (GCL) liner on the bottom. The GCL liner acts as a primary seal at a specified moisture content to provide additional protection for the liner system. Over this layer, a 60-mil, high-density polyethylene (HDPE) secondary plastic liner is installed to cover the bottom and sides of the landfill cell. The HDPE liner is smooth on the landfill bottom and textured on the landfill sides to increase friction and prevent slipping. The liner, which is resistant to chemicals and damage, is then welded together and tested to ensure a continuous seal in accordance with regulatory requirements. A blanket of geotextile fabric, composed of synthetic fibers, is laid above the liner and a geonet made of mesh-like plastic is added under the geotextile on the sides of the landfill to prevent fine clay particles from clogging the leachate collection layer and promote removal of leachate from the liner surface. Normally, the entire leachate collection layer would be comprised of two feet of basalt gravel on the liner that collects leachate and allows it to drain by gravity to the leachate collection pipe system, but this cell is different. For the first time in New Mexico, glass cullet from bottles processed at the Buckman Road Recycling and Transfer Station will provide a beneficial use as a portion of this drainage layer. The liner installation of the new cell is scheduled to begin in September of 2014 and completed by December. The new cell will have a surface area of approximately 10 acres with a disposal capacity of 4 years. Estimated cost of building the new cell is $3.6 million with $1.6 million of this for the blasting and removal of basalt. The Agency has contracted CDM Smith of Albuquerque, NM to design and prepare the technical plans and specifications for the liner installation.*"

the landfill disposal area (cells). For many years, this waste pile was not considered an asset, but a waste product. Both the soil cover and the underlying (waste) basalt were blasted, excavated and stored in the planned manner.

3. Randall Kippenbrock, P.E., has been the director of the Santa Fe Solid Waste management Agency that oversees the Caja del Rio landfill since June 2004. Early in his tenure as executive director, in consultation with the Agency's Joint Powers Board and others, he determined that the basalt could be crushed and sold as aggregate. Currently, there are a number of markets for the product (see Appendix B price list), including DOT-certified base course and aggregate for road building, repair and maintenance; landscape use; and as a component of pre-cast concrete.
4. Beginning October 7, 2013, Caja del Rio Landfill began construction of its next disposal space for solid waste, referred to as cell 5B, which will hold approximately 600,000 tons of solid waste over a useful life of four years. Like previous cells, creation of this cell or pit required blasting, which occurred 25 times between Oct. 7, 2013 and Feb. 21, 2014, an average of. Approximately 590,000 tons of basalt were excavated from the cell, roughly equivalent to 279,000 cubic yards. The cost of blasting and excavating for cell 5B is public information, and was $1.6 million. From this reported information, it is possible to calculate the per-ton cost of blasting and excavating Caja del Rio basalt at $2.87 per ton.
5. Caja Del Rio operates under EPA and State standards for landfills, and has a valid landfill permit. The CdR Rock Quarry operates as a extension of the landfill permit. Landfill permits are generally more stringent that gravel permits, and have stronger focus on clean water and clean air. The overall landfill permit is, in many ways, more comprehensive for the public welfare than a mining permit.[2]
6. Gravel, and other types of mining, are generally regulated and monitored by the State of NM's energy Minerals and Natural Resources Department, Mining and Minerals Division, which issues mining permits and collects and publishes production and sales statistics. Caja del Rio, because it operates under a stricter type of permit, is not required to be permitted by EMNRD. Because of this, CdR's production and sales are not reported to EMNRD's Mining and Mineral's Division and therefore the quantity of materials produced and sold are not included in EMNRD's data either at the County level or State level.
7. Crushed basalt generally is an acceptable material for road building and concrete manufacturing pursuant to ASTM C33 / C33M - 13.[3] However, crushed basalt is relatively expensive to produce in competition with gravel excavated, screened and washed from typical loose gravel-bed locations. Standard geotechnical textbooks indicate that crushed stone – particularly crushed basalt – is a perfectly acceptable aggregate, but is not particularly popular because other acceptable aggregates are available at lower cost.[4]
8. Contrary to assertions by Buena vista/ Rockology in their mine application and sworn testimony, Caja del Rio basalt is not an inferior construction material. CdR basalt has been repeatedly tested by Western Technologies; a letter confirming that the product meets all standards for NMDOT, FHWA, FAA, BIA, City and County of Santa Fe, and private contractors is attached. EMNRD statewide data does not separately collect data for crushed basalt, but lumps it together

[2] A case in point is that SFSWMA has installed a $1 million landfill gas collection system to deal with methane and non-methane gases generated in the depths of the landfill by digestion and fermentation of organics included in the solid waste.
[3] http://www.astm.org/Standards/C33.htm

[4] http://www.ce.memphis.edu/1101/notes/concrete/PCA_manual/Chap05.pdf ... Chapter 5, Aggregates for Concrete

in the “aggregates” category. The proposed La Bajada mine would be classified in the same category, and is believed to be part of the identical geological formation as Caja del Rio.

9. As a result of this incident, the SFSWMA management has recently negotiated an eight-year contract with Del Hur Industries. Del Hur, in turn, has an exclusive aggregate supply agreement with Associated Asphalt and Materials of Espanola, NM to provide 110,000 tons of aggregate materials annually. This will be DOT- acceptable aggregate for use in road building, repair and maintenance.
10. There is some legal controversy about whether crushed basalt is defined as a mineral, the extraction and/or production of which is covered by the state’s Mining Act. Rock used in construction is often regulated differently than rock which is the matrix of metal ores, for example. If the basalt – raw or crushed – is a mineral, then the owner of the material is owed a royalty; there is no set rule for how that royalty should be calculated. Based on a memo from Holland & Hart, dated August 4, 2010, the Agency is paying $.95 per ton of crushed basalt to the Bureau of Land Management (BLM), the presumed owner of the material in the name of the United States. This level of royalty payment to the US is consistent with an average price of about $7.50 per ton of extracted material and 1/8th royalty. According to Mr. Kippenbrock, the BLM is recalculating this royalty amount, since the value of the material in situ is virtually negligible. It is the value added from the blasting, excavating, crushing and screening ("beneficiation") that creates the market value. Based on other information[5], the payment to the BLM for gravel and sand is the fair market value as determined by appraisal. Thus, the old calculation (sales price times 1/8th royalty) is not valid. Mr. Kippenbrock estimates that the production costs, including amortization of the embedded blasting and excavation costs are about $5.00 per ton. Thus, an estimated fair market value of $.95 per ton for the in-situ material is quite reasonable assuming an average price after beneficiation is about $7.00. However, the BLM is authorized to permit production for governmental purposes free of charge. If 30% of the production has been consumed by government funded projects (e.g., NMDOT and Santa Fe County), then the royalty rate could be legitimately reduced to $.65 per ton while preserving the fair market value principle.
11. Mr. Kippenbrock said that the annual budget of the Agency is about $7 million. The enterprise is self-funded through landfill user fees and sales of crushed basalt. (Loss of basalt sales due to the proposed BV/R mine could jeopardize SFSWMA's self-funded status.)
12. The processing of basalt at CdR is operated by Del Hur Industries, a Port Townsend, WA, firm with quarries in 17 Western states. SFSWMA sells basalt, excavated to create landfill cells but otherwise unprocessed, to Del Hur, which crushes the material. For each ton of crushed basalt, Del Hur Industries remits $1.50 per ton to the Agency which includes $0.95 as a fair-market royalty payment to the BLM (the mineral owner, see note 11 above).
13. The yŜű $л.5p per ton ₥ŜűI·ƛyŜŘ ōè the Agency representă recovery of the contract costs to blast and excavate the previous cells, beginning in 2006. Mr. Kippenbrock estimates about 1.6 million tons of uncrushed basalt is stockpiled on site. $л₱pp per ton represents the previously incurred costs of blasting, excavating and stockpiling the basalt, but not the overburden, from the cells. Thus, the yŜű value of the stockpile is about ÞуулΣллл to SFSWMA. Basalt sales significantly offset the $7 million needed annually to operate the landfill.
14. According to Del Hur the basalt aggregate materials are not subject to NM gross receipts taxes due to resale. Del Hur does not sell any material to landscapers or non-contractor individuals

[5] http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/non-energy_minerals.Par.48557.File.dat/sand.pdf

15. Because the Caja del Rio Quarry is not registered or permitted through EMNRD, Mr. Kippenbrock does not know if the minimal severance taxes and resource excise taxes are required on gravel and other aggregates .
16. Mr. Kippenbrock had two comments regarding the Buena Vista/ Rockology Application for Mining Permit on La Bajada:
    a. A first lab report was prepared by Western Technologies (the same lab used by SFSWMA) on 9-21-07 based on a sample provided by Rockology owner Steven Hooper. The only relevant data included in that report was an absorption % of 1.4. This single number was used and reported in the Application. It would have been more appropriate to have the testing laboratory send a tech to the field to draw samples, but, in this case, the sample was provided by the client.
    b. A second lab report is dated October 4, 2007. This sample is described as "base course." The project name is "Rail Runner Phase 2" and the sample source is "Buena Vista Pit." This analysis reported an absorption of 2.2, with an apparent specific gravity of 2.868 for the coarse (only) fraction. There is no estimate of crush strength or any other relevant data to substantiate Buena Vista's application declaration that, "*The basaltic material is a durable, sound aggregate,…"* Nor does it match the specific gravity of 2.64 cited in the application (on page NBB-22 of the BCC packet).
17. Del Hur's Caja Del Rio Rock Quarry has only one permanent employee. His duties include loading trucks on site and arranging delivery when required.
18. The Agency weighs trucks unloaded and loaded and provides these tickets to Del Hur Industries for use in billing accounts. Invoices are prepared, as needed, by Del Hur Industries' home office accounting department.
19. Caja del Rio crusher operation has the capacity of 200 tons per hour. This is about average for permanently installed equipment. Some gravel operations use mobile equipment with a capacity of 100 tons an hour. Mr. Kippenbrock estimates that Del Hur has about $2.0 million in equipment. In addition to the crusher, screens and conveyors, there is a big payloader, a mining dump truck, a water truck and a construction trailer used as a sales and fulfillment office. Since Del Hur offers delivery, there may well be several 12 or 18-yard dump trucks. The price sheet indicates at least one pup (delivery trailer) is also on the premises.
20. The Del Hur crusher operations crew consists of three specialists and a foreman. The foreman has stated that a total of four specialists was very thin for running a complex, fixed base crusher operation. This crusher crew moves around among a number of Del Hur's operations in the Western states. Typically, the crusher crew conducts operations at Caja Del Rio about three times a year. They crush enough to fulfill anticipated orders. The number of crew hours is about to rise, due to the large contract mentioned in note 10, above. Adding that order to the existing workload, it will take about 80 days of work for the four-man crew. This is equivalent to about 1.3 FTE. Including 1.0 FTE for the permanent loader operator and 0.2 for invoicing and weighmaster services, total employment equivalent at this quarry operation is 2.5 FTE, equivalent to 1 FTE per 64,000 tons produced. At this rate, the proposed production of the BV/R mine, 250,000 tons per year, would require 3.9 FTE. (These figures do not include blasting, which is done by a specialist contractor, and in the case of CdR, was completed under the landfill's budget and recouped by sales to del Hur.)
21. Del Hur estimates that water consumption for the crusher operation alone is about 3 gallons of water per ton of material produced. In addition, Del Hur uses additional water to settle the dust on the roads and on the soil piles. During the windy months of March through June, the rock quarry uses about 5,000 gallons of water a day to moderate windblown dust from the gravel

and topsoil piles and the quarry roads. Treated effluent water is piped from the City wastewater treatment plant located a few miles from the Quarry.

Caja Del Rio Quarry Rock Sales Price List

	Freight on Board (FOB)	Delivered
ROCK TYPE	PRICE PER TON	PRICE PER TON
¾" minus – driveway base	$5.95	$10.95
¾" NMDOT type 1 base	$7.45	$12.95
Chips* -- (#57, 67, 7, 8, ¾")	$8.95	$13.95
3/8" minus – crushed fines	$8.95	$13.95
Rip rap	$15.00	$20.00
¾" minus – general fill	$3.75	$8.95

* Chips are sold for subsequent use in manufacturing concrete and asphalt. This is the bulk of the contract sales.

7 ton or 5 yard minimum purchase required on delivered loads. Delivered prices are within a 10-mile radius from the Quarry. Beyond that radius, deliveries will be charged at FOB price plus truck time.
Dump Truck Rates: $75.00 per hour – solo; $85.00 per hour – truck and pup

Jobs involving substantial volumes will be quoted on an individual basis.

Attachment #3: Santa Fe County Board of County Commissioners Meeting Minutes for December 13, 2011

COUNTY OF SANTA FE)
STATE OF NEW MEXICO) ss

BCC MINUTES
PAGES: 164

I Hereby Certify That This Instrument Was Filed for Record On The 2ND Day Of February, 2012 at 09:52:08 AM And Was Duly Recorded as Instrument # 1659253 Of The Records Of Santa Fe County

Witness My Hand And Seal Of Office
Valerie Espinoza
Deputy _____ County Clerk, Santa Fe, NM

SFC CLERK RECORDED 02/02/2012

SANTA FE COUNTY

BOARD OF COUNTY COMMISSIONERS

REGULAR MEETING

December 13, 2011

Virginia Vigil, Chair – District 2
Liz Stefanics, Vice Chair – District 5
Robert Anaya – District 3
Kathy Holian – District 4
Danny Mayfield – District 1 [excused]

SANTA FE COUNTY

REGULAR MEETING

BOARD OF COUNTY COMMISSIONERS

December 13, 2011

This regular meeting of the Santa Fe Board of County Commissioners was called to order at approximately 2:00 p.m. by Chair Virginia Vigil, in the Santa Fe County Commission Chambers, Santa Fe, New Mexico.

Employees of the Community Services Department led the Pledge of Allegiance and State Pledge, following roll call by County Clerk Valerie Espinoza and indicated the presence of a quorum as follows:

Members Present:
Commissioner Virginia Vigil, Chair
Commissioner Liz Stefanics Vice Chair
Commissioner Kathy Holian
Commissioner Robert Anaya

Member(s) Excused:
Commissioner Danny Mayfield

V. INVOCATION

An invocation was given by Renee Sandoval.

VI. APPROVAL OF THE AGENDA

A. Amendments
B. Tabled or Withdrawn Items

CHAIR VIGIL: Ms. Miller.

KATHERINE MILLER (County Manager): Madam Chair, yes, there's a couple of tabled or withdrawn items. Under "Special Presentations" IX. B that has been tabled. We have a long agenda and the next item is on page 5, item IVX, F. 1, that item is also tabled and then on that same page item IVX, I.2 is withdrawn. Under the "Public Hearing" item XV A. 3 is tabled.

COMMISSIONER STEFANICS: Madam Chair.

CHAIR VIGIL: Commissioner Stefanics.

COMMISSIONER STEFANICS: I move approval of the amended agenda.

COMMISSIONER HOLIAN: Second.

The motion passed by unanimous [4-0] voice vote.

VII. APPROVAL OF CONSENT CALENDAR

CHAIR VIGIL: Are there any consent calendar withdrawals? Commissioners?

COMMISSIONER HOLIAN: Madam Chair, I move approval of the Consent Calendar.

COMMISSIONER STEFANICS: I'll second.

The motion passed by unanimous [4-0] voice vote.

XIII. CONSENT CALENDAR

A. Miscellaneous

1. Resolution No. 2011-184, a Resolution Requesting an Increase to the Corrections Operations Fund (247) to Budget the Fiscal Year 2011 State Criminal Alien Assistance Program (SCAAP) Award Received for Expenditure in Fiscal Year 2012 / $15,258 (Corrections Department)

excise tax on alcohol and any other kind of liquor. I was just at the Revenue and Stabilization Tax Committee this morning and they did pass the resolution that we supported that allows for the current distribution of local liquor taxes to go to drug courts. So that will redivert some dollars from the general fund which receives the excess dollars that don't go to counties that were originally intended to go to counties and so that bill was supported by Tax and Rev. It still has to go to the legislature. This may or may not succeed in the legislature. Part of the problem that it creates is there's a barrier there to moving it forward based on the fact that the industry argues that the current distribution was intended to go for the purposes that this option would create. And I know that Commissioner Anaya is familiar with that. He and I actually worked on this through the legislature. And I think and I'm not sure if it might even be considered germane but I think we should constantly keep this at the forefront of our legislators. I think for the most part they are sympathetic to try and look for dollars to deal with these critical issues.

I recommend that we enact this resolution and bring it to the consciousness of our legislators and move for approval.

COMMISSIONER STEFANICS: I'll second.

CHAIR VIGIL: Motion and a second. Any comments?

COMMISSIONER STEFANICS: Madam Chair, I think that we need to continue to put forward – there is emphasis on the use of these dollars and it will ultimately be left to the state legislators to decide but if we don't speak to what is important in terms of services or in terms of what the County desires it'll never be considered. Thank you very much.

CHAIR VIGIL: Thank you. Any other comments?

COMMISSIONER ANAYA: Madam Chair, having worked directly with this as you stated for several years I actually agree with the sentiment of some of the industry when they speak to the use of the current liquor excise tax. I think that the tax that we currently pay is not being utilized as it was intended to be utilized. In this resolution, this resolution supports giving the local entities the option to pursue through a voter referendum a tax that doesn't impose a tax. I couldn't speak at this time due to the economics of increasing any new taxes but I don't think this resolution does that. I think it just gives our other local entities an alternative. But I do strongly advocate that more of the money that goes into the current tax be distributed for it's intended purpose instead of being diverted to other areas so those are my comments. Thank you, Madam Chair.

CHAIR VIGIL: Okay, I have a motion and a second.

The motion passed by unanimous [4-0] voice vote.

E. Resolution No. 2011-191, A Resolution Requesting that the City of Santa Fe Release Additional Effluent into the Santa Fe River to Support the Historical Agricultural Needs of the Village of La Cieneguilla and The Village of La Bajada (Commissioner Anaya)

CHAIR VIGIL: Commissioner Anaya.

COMMISSIONER ANAYA: Madam Chair, Commissioners, the public and the community I think we've heard a couple of resolutions today that link very closely to this resolution that I have before you today. The resolution of supporting buying local and being creative with purchases as well as the resolution relative to the farm bill priorities and the regional food system ties closely with what the Village of La Bajada and the Village of La Cieneguilla have done for hundreds of years and that's take care of the livelihood of their families and grow agricultural crops for the community and for their living expenses and to survive.

In this current year because of drought conditions and other issues that have arisen associated with beavers and other issues in the river, in the Santa Fe River, many of those communities include La Cieneguilla and La Bajada were not able to grow their crops because there was no water. And I think that goes contrary to the two resolutions that we previously approved that we want to encourage people to grow their crops. We want to encourage agricultural use but if there's no water getting to those communities it's a little difficult to do that.

With that I also heard today that there was some discussion on Public Radio today associated with what the City may or may not do associated with this water use and effluent and that they potentially might not release more water.

I would strongly publicly ask for the Mayor of the City of Santa Fe and the entire City Council to seriously review and consider the contents of this resolution. This resolution isn't about a brand new project. This isn't a resolution about a new business in a community or creating a problem in a community. This resolution is about sustaining a community and sustaining multiple communities for agricultural purpose and use.

So with that said, a resolution requesting that the City of Santa Fe release additional effluent into the Santa Fe River to support the historical and current agricultural needs in community villages of La Cieneguilla and La Bajada.

Whereas, Santa Fe County has been experiencing severe drought conditions including above normal temperatures with little or no precipitation; and

Whereas, numerous streams including the Santa Fe River have experienced decreased water levels. Whereas, the village of La Cieneguilla and La Bajada encompass a segment of the Santa Fe River which also conveys water that is released from the City of Santa Fe's wastewater treatment plant; and

Whereas the villages of La Cieneguilla and La Bajada are traditional acequia-based communities that utilize the Santa Fe and whose culture and heritage are intrinsically tied to water and agriculture; and

Whereas, the County is experienced increased urbanization and development that is contributing to the loss of water in the Santa Fe River and whereas there is a critical need for the villages of La Cieneguilla and La Bajada to maintain a traditional and sustainable local small farming and ranching economy that is essential to the health and economic well being of the County residents.

Now, therefore, be it resolved that the Board of County Commissioner of the County of Santa Fe request that the City of Santa Fe release additional effluent water into the Santa Fe River to continue to support the historical and current agricultural needs in the downstream community villages of La Cieneguilla and La Bajada.

Madam Chair, I would first move for approval.

COMMISSIONER STEFANICS: Second.

COMMISSIONER ANAYA: And with the second, Madam Chair, I would just further emphasize that as we consider other uses of rare water from the Buckman Direct Diversion project that we also in addition to this request to the City of Santa Fe should consider releasing water for agricultural purposes from the Buckman Direct Diversion project into the aquifers and into the streams to further assist with the agricultural historical uses that exist through Santa Fe County.
Thank you, Madam Chair.

COMMISSIONER HOLIAN: Madam Chair.

CHAIR VIGIL: Commissioner Holian.

COMMISSIONER HOLIAN: Thank you, Madam Chair. Thank you, Commissioner Anaya for bringing this forward. As you know food security is a really, really big issue with me. And I think that we're talking about organizing a water summit perhaps in a few months, and I think a good issue for that water summit would be how La Bajada can not only have a water source but some back up water sources as well. So I just wanted to ask you if they also use ground water for their agricultural activities?

COMMISSIONER ANAYA: Madam Chair, Commissioner Holian, they use some limited groundwater of which we're trying to provide them more access as you know to a larger well to augment their service, but many of the residents frankly didn't – weren't able to perform their agricultural duties, if you will, and generate revenue to feed their families and had to do alternative things to just get by.

COMMISSIONER HOLIAN: Thank you, Commissioner. I think that this really illustrates why you need not only a water source but you need back up water sources as well. Especially if you're really going to take agriculture seriously. Thank you.

CHAIR VIGIL: Commissioner Stefanics.

COMMISSIONER STEFANICS: Thank you, Madam Chair. And, thank you, Commissioner, for bringing this forward. I certainly support this particular resolution. In regards to BDD I think that you would want to discuss with your constituents whether or not they could be paying customers because right now the BDD is not in a position of providing water services without some compensation. So I totally support this and as you go forward you might just want to discuss that with them as well. Thank you.

COMMISSIONER ANAYA: Madam Chair, on that point if I could. Madam Chair and staff can further clarify this but my understanding that we have access to water within the diversion project both treated through the diversion plant and raw untreated water and that annually we could utilize some of that raw so I think there might be a compromise because many of these communities and the residents therein probably don't have the mechanisms to sustain being part of a utility but if we have water that we could divert and flow through our communities for this purpose that is uncommitted water within our utility I think that might be – Ms, Miller, is that something that you'd like to comment on and Mr. Ross?

MS. MILLER: Madam Chair, Commissioner Anaya, I think the issue would be how we can deliver it. Based on the agreement that was done with Las Campanas that if there was excess capacity with the well water there it could get incorporated to their agreement that we could use it elsewhere, it would be how we can convey it to elsewhere and then and then also whether there's any opportunity to do anything at the [inaudible] plants at the State Pen and how we could convey that water also.

COMMISSIONER ANAYA: Madam Chair, I appreciate the comments and the feedback and we'll continue to work in progress. But I very much would appreciate the support of the Commission.

CHAIR VIGIL: I think you have the Commission support. I certainly support it. I think this is a timely resolution. I think in all fairness to our city sister, there is no doubt in my mind that if they have the ability to release water and keep the water flowing that they would. Santa Fe River is one of the top ten endangered rivers in the nation and the Mayor has created a river board of some kind, I'm sorry the name doesn't come to me right away, but there are representatives from Agua Fria Village who would also benefit from this and they have had much issue with what kind of water would flow down. They're concerned about effluent water and so the issue has been quite dynamic and discussed for quite some time as far as I know. It might alert the City to better inform us as to why that doesn't occur. It might alert the City – I mean what I've learned as being sort of piece by piece they do have a scheduled release and it's dependent on their reservoir and they're advised by their own experts and those kinds of things. But what I like about this resolution is that it says, look at other resources to see if we can work something out at this point in time. And I think that's moving in the right direction for these communities.

So with that I think we can move forward on the vote.

The motion passed by unanimous [4-0] voice vote.

XI. F. Proclamation in Memoriam of Gerald González (Commissioner Anaya)

COMMISSIONER ANAYA: Madam Chair, it is an honor and a privilege to do this along with yourself as the chair and the entire Commission. I'm going to read the proclamation, Mr. Ross and I are going to read the top part of the proclamation and let you help us finish it Madam Chair and then I'd like to allow Mr. Ross to make some remarks and anyone else that would like to outside of the Commission, if that's okay with you, that would like to as well.

A proclamation honoring the life of Gerald T. E. González.

Whereas, former County Manager Gerald T.E. González, passed away Tuesday, November 1, 2011 at the age of 68;

MR. ROSS: Whereas, Gerald lived an extraordinary life, beginning in his birthplace of Las Vegas, New Mexico, and continuing through his formative years in

REPORT

City of Santa Fe

Reclaimed Wastewater Resource Plan

SELECTED PAGES RELEVANT TO EXISTING OVERCOMMITMENT OF EFFLUENT

April, 2013

Executive Summary

Reclaimed wastewater (RW) is a vital and valuable water resource that helps the City of Santa Fe meet its current water supply needs; it can also play a critical role in meeting future potable water supply demand. Since the adoption of the previous RW plan, the Treated Effluent Management Plan (TEMP) in 1998, the quantity of available RW has been reduced by 29% because of the City's comprehensive indoor water conservation programs while RW use has more than doubled (Figure 3). This Reclaimed Wastewater Resource Plan (RWRP), developed with the assistance of the "Working Group" members identified on the cover page, prioritizes current RW uses and identifies strategies and implementing actions to optimize current and future use of the resource. This analysis concluded that RW availability is currently limited during the peak summer irrigation months and that the shortfall will increase in the future with new RW uses anticipated by the City. The methodology used for prioritizing RW uses herein can be applied in the future to new circumstances; thus, this plan serves not only as a blueprint for RW use today, but also serves as a roadmap for the future.

This RWRP considers the City's current and projected RW needs through the 2020s. RW availability is projected 40 years in to the future through 2052. Based on the City's average RW production of 1,887 million gallons/yr (5,790 af/yr) over the past five years, this RWRP assumes that 1,825 mg/yr (5,600 af/yr) and 152 mg/mo (467 af/mo) of RW is available (Section 4) at a steady daily and monthly rate for the 40-year planning period. The difference (62 mg/y; 190 af/yr) between the RW produced and the amount allocated in this Plan is reserved to accommodate for changes in use, metering uncertainty, and/or changes in future conditions.

The RW use options considered in this analysis include current uses: direct sale for dust control and other construction purposes; irrigation of municipal recreational fields at the Municipal Recreational Complex (MRC) and the infield at Santa Fe Downs; irrigation of the Marty Sanchez Links de Santa Fe and the Santa Fe Country Club golf courses; dust control at the regional landfill; watering livestock on the Caja del Rio; irrigation of the education-scape at the New Mexico Game and Fish facility; and for Santa Fe River flows downstream of the City's wastewater treatment plant to support the river/riparian ecosystem and local agriculture (Section 5). The analysis also includes potential future uses: irrigation of the turf at the Santa Fe Equestrian Center (also a previous use); irrigation of the Southwest Area Node Park; irrigation of turf at schools, the library and other open space along the Southwest Sector effluent pipeline; offsetting the surface water depletions in the La Cienega area caused by the City's pumping of the Buckman well field; piping RW upstream to the Santa Fe River; and future potable water supply (Section 5).

For this analysis, an annual, monthly and maximum peak daily RW budget for all of the current and potential future RW uses was determined, either based on past usage, contracts, requests, or estimates (Section 6). The demand for monthly and daily RW is great. The combined monthly demand for all the options, except RW for potable water supply, is 213 mg/d (Table 2), 40% more than the RW available; the combined daily demand of all the options (except RW for potable water) supply is 6.9 mg/d (Table 2), 38% more than the available amount. Hence, RW demand is greater than available supply under

current average conditions, which will only worsen under drier hotter drought and projected climate change-impacted conditions.

The RW options were ranked according to criteria and methodology (Section 5) approved in May 2012, by the City's governing body. Using the ranking methodology and then prioritizing uses that are non-discretionary (long-term contracts and permit requirements), the RW options were prioritized; the first three options retain equal ranking, because no distinction is made within these uses required by permits versus long-term contracts):

1. Buckman Well Field Permit Compliance- 33 mg/yr; 100 af/yr
1. US Forest Service Livestock Water – 2.3 mg/yr; 7 af/yr
1. Santa Fe Country Club Golf Course- 130 mg/yr; 400 af/yr
4. Municipal Recreation Complex – 54 mg/yr; 165 af/yr (65 mg/yr requested)
5. On-demand Sales for Dust Control, Construction– 31 mg/yr; 95 af/yr (65 mg/yr in 2007)
6. Dust Control at Regional Landfill – 6 mg/yr; 17 af/yr (12 mg/yr requested)
7. Marty Sanchez Links de Santa Fe Golf Course– 168mg/yr; 517 af/yr (196 mg/yr requested)
8. Recreational Infield at Santa Fe Downs – 43.5 mg/yr; 134 af/yr
9. Future Potable Water Supply – approximately 717 mg/yr; 2,200 af/yr
10. Southwest Area Node Park - 19 mg/yr; 57 af/yr
11. New Mexico Game and Fish Educational Landscape – 1 mg/yr; 4 af/yr
12. Southwest Area Irrigated Parks and Open Space – 48 mg/yr; 149 af/yr
13. Downstream Santa Fe River – 600 mg/yr; 1,843 af/yr
14. Upstream Santa Fe River – 177 mg/yr; 543 af/yr
15. Santa Fe Equestrian Center – 41 mg/yr; 127 af/yr
16. Urban Food Production (originated from 2nd public meeting; no RW budget developed)

These options and their monthly RW budgets were then compared to the available RW (Section 7) to see how much of the RW needs could be met. The assessment was performed in three different time frames - 'current', 'near-future', and '2020s', including only those projects relevant to the different timeframes (Section 7). For example, since potable use of RW will likely take a decade to implement, the use is shown to first come 'online' in the 2020s analysis.

This analysis showed that all but two of the 'current' RW options can be met with the available RW at this time (Figure 12 and 13); the exception is that there are insufficient flows to fully meet the Downstream Santa Fe River 3 mg/d, target flows in June and the Santa Fe Equestrian Center RW request in May, June and July. In the near future (approximately 2018), the shortfall in RW will be even greater: using the Plan's criteria and ranking method, the Downstream Santa Fe River, the Santa Fe Equestrian Center, and the Upstream Santa Fe River option do not have adequate supply during the summer months (Figure 14). By the 2020s, when the infrastructure and permits to use RW for potable supply may be ready, no RW is available for the SF Equestrian Center or the Upstream Santa Fe River, and there continues to be insufficient RW to meet the 3 mg/d target flows for Downstream Santa Fe River in June (Figure 15). By the 2020s, using the RW that is not

1. MRC: RW is used at the Municipal Recreation Complex (MRC) to irrigate playing fields for baseball, soccer, football, rugby, and other recreational play. RW is piped from the WWTP via the "northern purple pipeline" to a storage pond just north of the MRC. From this pond, RW is metered, pumped and used on the MRC irrigated fields. A City resolution from 1995 permits up to 2 mg/d for use by Marty Sanchez Golf Course and the MRC via the "northern" RW distribution system. Since the installation of the pipeline, three additional users (US Game & Fish, Caja del Rio Landfill and USFS) are also supplied by the pipeline. City Parks Division pays its share of the electric costs to pump RW from the WWTP to the storage pond.

   - **RW budget**: Annual: 54 mg/yr (165 af/yr); Peak month: 11 mg/mo (34 af/mo); Daily maximum: 360,000 g/d. The annual value of the RW is $163,000. **[Requested annual RW budget is 65 mg/yr (200 af/yr)]**

2. SF Downs: RW at the Downs of Santa Fe is used both for irrigating the race track infield (approximately 92%) and for irrigating trees and other landscaping. The infield is made available for recreational sport play like soccer and football. An agreement signed between the Pueblo of Pojoaque and the City defines that Pojoaque will pay $2.59/1,000 gallons for any RW **not** used to irrigate the infield and generated approximately $9,000 in revenue in 2011. The City pays Pojoaque $1 for the use of the infield playing area.

   - **RW budget:** Annual: 43.5 mg/yr (133.5 af/yr); Peak month: 8.2 mg/mo (25 af/mo); Daily maximum: 400,000 g. The annual value of the RW that is traded to the Downs for use of the turf sports fields is approximately $121,000.

3. SWAN Park: The design for the planned Southwest Activity Node (SWAN) Park identifies one large, natural-grass, irrigated recreational area: the Field Sports Area. The area is designed to accommodate organized sports groups like soccer, football, rugby, lacrosse and Ultimate Frisbee. RW will be used to establish some park landscaping during start-up (5-7 years), while other areas (orchards) will continue to receive RW irrigation for the long term. The Field Sports Area is planned to be constructed during Phase II (possibly finished 2016). The sole source of irrigation water for the park is via a proposed RW pipeline from the WWTP and a 200,000 gallon on-site RW storage tank. As currently designed, RW will be pumped into the RW pipeline using the same lift station that also pumps RW north toward the MRC and Marty Sanchez GC. For this analysis, the SWAN Park RW budget is assumed to be constant into the future, beginning in 2014, even though the park's development is phased and the xeric landscaping may require less water in the long term once established. The working

assumption is that City Parks Division will pay for the pumping costs and annual O&M costs associated with the RW pipeline.

- **RW budget:** Annual: 19 mg/yr (57 af/yr); Peak month: 4 mg/mo (11 af/mo); Daily maximum: 120,000 g. The annual value of the RW is $56,000.

4. SW Irrigated Parks: The 12-inch RW pipeline designed for SWAN Park has excess capacity than the water needs of the planned park. The entire RW pipeline (identified as the Southwest Effluent pipeline in City capital improvement projects) has a similar capacity to the RW pipeline that supplies the "northern" uses (MRC, Marty Sanchez GC, etc.) and will share the RW lift station of the northern RW pipeline. The pipeline's planned route extends near public facilities (e.g. Capital High School, Southside Library, Cesar Chavez Elementary School, Ortiz Middle School) that could use RW for irrigation. However, since the exact RW uses along the "southwest RW pipeline" have not been determined, an overall RW budget for the pipeline, excluding SWAN was developed by allocating approximately the same RW budget as is currently used by the MRC. Because the pipeline shares the lift station with the "northern" pipeline, it is likely that additional RW storage on the system is needed. The combined budget of SWAN Park plus this option of 0.39 mg/d is less than one-sixth of the 2.0 mg/day pipeline capacity. The working assumption is that City Parks Division will pay for the pumping costs and annual O&M costs associated with the RW pipeline.

   - **RW budget:** Annual: 48 mg/yr (149 af/yr); Peak month: 10 mg/mo (30 af/mo); Daily maximum: 330,000 g. The annual value of the RW is $146,000.

5. Downstream SF River: The Santa Fe River downstream of the WWTP currently receives over 70% of the RW produced and constitutes all but storm flows in the reach of the Santa Fe River between the WWTP and the springs that emerge at La Cienegilla. The RW flows through the Santa Fe's Rural Protection Zone (RPZ, City property west of the Santa Fe Airport), then land owned by Santa Fe County, the Bureau of Land Management, and private land owners. The stream flow is used for irrigation by land owners in La Cienegilla, El Cañon Ranch, Tres Rios Ranch, and the village of La Bajada. The City Attorney's office l opinion is that the City currently has no legal obligation to deliver RW to water right holders downstream, because cities control the use of artificial waters under the City of Roswell court case and the New Mexico statute, NMSA 1978, § 72-5-17. A decade of restoration in the RPZ has created a thriving beaver population, lush riparian vegetation, and wetland areas. It is unknown how much water is needed to support the restored areas and the needs of the downstream agricultural needs.

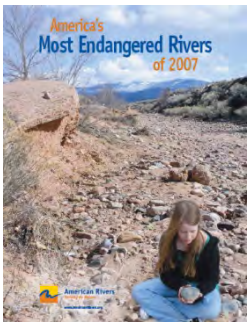
The irrigators of approximately 100 acres of land downstream of the WWTP and the Santa Fe County Commissioners have requested that the City release "sufficient

reclaimed water to the downstream users of La Cienegilla, La Cienega, the Village of La Bajada and the Pueblo of Cochiti for historic and agricultural traditions" (Board of County Commissioners of Santa Fe County 2011 and 2012 Resolutions (Appendix E). The State Legislature approved similarly worded memorials in 2011 and 2012 (Appendix E).

For this analysis, the Working Group assumed a minimum flow ranging from 0.5 mg/d in the winter season to three mg/d during the peak irrigation months. The 3 mg/d summer target flow value is based on a broad-brush understanding of stream flow conditions and downstream agricultural needs. This option assumes that within the annual water budget, the RW from the WWTP can be patterned to accommodate irrigation needs. The budget for this option may need to be revised in the future, after more stream flow data has been collected and analyzed. This option has no ongoing O&M or distribution costs.

- **RW budget:** Annual: 600 mg/yr (1,843 af/yr); Peak month: 93 mg/mo (285 af/mo); Daily maximum: 3,000,000 g. The annual value of the RW is $1.82 million.

6. Upstream SF River: This option involves pumping water from the WWTP upstream to a currently unspecified point and delivering about 0.5 mg/d (0.75 cubic feet per second) of RW to the Santa Fe River daily. The pattern of release could be altered, but may be constrained during the summer months by other RW demands. The purpose of the option would to create another "living" river reach along the Santa Fe River. The quantity of water would probably provide surface water flow for about 1-3 miles, depending upon weather and river channel conditions. The City would need to pay for the capital costs to install the pipeline and pumping equipment and be responsible for the continued pumping and O&M costs.



- **RW budget:** Annual: 177 mg/yr (543 af/yr); Peak month: 15 mg/mo (45 af/mo); Daily maximum: 500,000 g. The annual value of the RW is $536,000.

7. Marty Sanchez GC: The Marty Sanchez Links de Santa Fe golf course currently uses exclusively RW to irrigate the golf course and other facility landscaping. RW is piped from the WWTP via the "northern purple pipeline" to a storage pond just north of the MRC. A City resolution from 1995 permits up to 2 mg/d for use by Marty Sanchez Golf Course and the MRC via the "northern" RW distribution system. From there, RW is pumped to a series of ponds around the golf course before being distributed by the irrigation system. City Parks Division pays its share of the electric costs to pump RW from the WWTP to the storage pond, and then to the golf course.

- **RW budget:** Annual: 168 mg/yr (517 af/yr); Peak month: 27 mg/mo (83 af/mo); Daily maximum: 900,000 g. The annual value of the RW is $536,000. **[Requested annual RW budget is 196 mg/yr (600 af/yr)]**

8. SF Country Club GC: Under the existing contract, the Santa Fe Country Club has been irrigating its golf course with RW since the 1950s. RW is pumped during the day from the WWTP to two on-site storage ponds, and then applied to the golf course during the evening and early morning hours. The RW budget presented herein is based on actual use, not the existing, in-perpetuity contract, which allows the SF Country Club GC to use up to 700,000 gpd all year long (an equivalent of 256 mg/yr or 784 af/yr). SF Country Club GC maintains the conveyance pipeline and pays its share of the electric costs to pump RW from the WWTP to its storage ponds. In exchange for allowing the public to play on the golf course, the Club does not pay for the RW.

   - **RW budget:** Annual: 130 mg/yr (400 af/yr); Peak month: 20 mg/mo (77 af/mo); Daily maximum: 700,000 g. The annual value of the RW is $395,000.

9. SF Equestrian Center: The Santa Fe Equestrian Center used RW from the City to irrigate the equestrian polo fields through 2006; no RW contract currently exists between the parties. The irrigated fields are used for the center and also rented by local sports clubs. Currently the fields are irrigated with groundwater from RG-590 (e.g. Hagerman well) with water rights leased from Santa Fe County. The water budget herein originates from a 12/5/2011 letter from a SF Equestrian Center representative to the City stating interest in securing at least a 10-year agreement with the City for effluent. In the past, SF Equestrian Center maintained the conveyance pipeline and was responsible for the electric costs to convey RW from the WWTP to its facility.

   - **RW [Requested] budget:** Annual: 41 mg/yr (127 af/yr); Peak month: 12 mg/mo (38 af/mo); Daily maximum: 400,000 g. A RW agreement with the SF Equestrian Center could generate $125,000 annually.

10. On-demand Sales: The WWMD has a stand pipe to provide RW to customers for construction, dust control and other similar uses. The City's water conservation ordinances require the use of RW for all appropriate construction purposes. On-demand sales have declined in recent years. During fiscal year 2011/2012, the sales from the standpipe equaled approximately $90,000. The RW budget for on-demand sales used in this analysis is 5% greater than actual use of the past three years, but is not as high as 2007 use.

- **RW budget:** Annual: 31 mg/yr (95af/yr); Peak month: 4 mg/mo (14 af/mo); Daily maximum: 140,000 g. The stand pipe sales will generate up to approximately $94,000 annually. **[Amount sold in 2007: 40 mg/yr (123 af/yr)]**

11. NM Game & Fish: The New Mexico Department of Game and Fish has their headquarters on One Wildlife Way off Caja del Rio Road. The agency uses RW for a small pond and native vegetation that is all part of an on-site wildlife educational center. Water is pumped to NM Game & Fish from one of the storage ponds at Marty Sanchez GC. Relative to other uses, very little RW is used. The annual contract with NM Game & Fish allows the agency to use up to 1.6 mg/yr (4 af/yr).

- **RW budget:** Annual: 1.6 mg/yr (4 af/yr); Peak month: 0.23 mg/mo (0.55 af/mo); Daily maximum: 10,000 g. The City will collect about $5,000 under this contract in 2013.

12. Landfill: Caja del Rio Landfill uses RW for dust control and rock crushing/screening during landfill operation. Use has varied between 2 to 9 mg/yr (7- 18 af/yr).

- **RW budget**: Annual: 6 mg/yr (17 af/yr); Peak month: 1.3 mg/yr (4 af/mo); Daily maximum: 40,000 g. RW use by the Landfill generates approximately $17,000 per year. **[Requested annual RW budget is 12 mg/yr (37 af/yr)]**

13. BW Permit Compliance: The Buckman Well Field Permit Compliance option is a way for the City to fulfill to a New Mexico Office of the State Engineer (OSE) permit condition associated with pumping the City's Buckman wells (RG-20516 et al). The OSE annually calculates impacts from Buckman well groundwater pumping on the surface waters, including the springs in the La Cienega area using a groundwater model. The City is currently seeking recognition from the OSE that the release of water from the WWTP has mitigated the impacts over the past decades and that future offset calculations need to include RW released to the river. Other downstream discharges, like Option 5, could likely also to be counted toward permit compliance. The RW budget presented herein is preliminary. This budget assumes a constant pattern of release over the course of a year, although the OSE may ultimately require a different flow schedule.

- **RW budget:** Annual: 33 mg/yr (100 af/yr); Peak month: 3 mg/mo (8 af/mo); Daily: 90,000 g. The annual value of the RW use is $99,000.

14. USFS Livestock Water: Historically, US Forest Service well RG-29725 supplied

livestock and wildlife water on the Caja del Rio. Among other difficulties, the drop in groundwater levels from Buckman well field pumping reduced the viability of the deep well, which currently only has a 17-foot water column. When water supply is interrupted, the livestock seek water from the Santa Fe River or the accessible portions of the Rio Grande. To increase water supply reliability, the City has been providing RW as a replacement supply for livestock and wildlife on the mesa since 2006. By providing the water to the USFS, the City's impacts on the well are offset and livestock intrusion into sensitive riparian areas can be reduced. The RW, pumped from the 500,000 gallon pond at the Landfill, reaches the stock tanks on the mesa through approximately 26 miles of small-diameter, above ground PVC lines. The budget herein is based on the expired RW agreement between USFS and the City. Actual use has reached 2.9 mg (9 af) in one year.

- **RW budget:** Annual: 2 mg/yr (6 af/yr); Peak month: 0.4 mg/mo (1 af/mo); Daily maximum: 15,000 g. The annual value of the RW is $6,400.

15. Future Potable Supply: RW is a viable supplement to the City's other potable water

supply sources. This could be accomplished in one of at least three ways: 1) returning the water via a pipeline to the Rio Grande and diverting an equal amount from the river at the Buckman Direct Diversion; 2) direct potable reuse (DPR) via the Buckman Regional Water Treatment Plant (WTP); or 3) by recharging the groundwater with RW and then extracting it in the future. "Direct potable reuse (DPR) projects benefit public water supplies, agriculture, the environment, and energy conservation" (NWRI, 2012). This RWRP proposes a separate work effort to evaluate the merits of the three approaches or to pilot a project analyzing the need for RW pre-treatment before mixing it with the raw Rio Grande water at the Buckman WTP. Herein the quantity of water available for potable water supply is estimated by using the RW available during the non-irrigation season.

- **RW budget:** Annual: approximately 717 mg/yr (2,200 af/yr). No monthly or daily maximum is identified since this option uses what remains after other obligations are met. The annual value of the RW is $2.17 million.

16. Urban Food Production: RW could be a valuable source of water to produce food in the areas served by the RW distribution system. Much of the landscaping at SWAN Park, for example, includes orchards. The production of local food to increase the region's food security is emphasized in the Sustainable Santa Fe Plan. Because this option was added to the Plan from comments provided at the public meeting on January 24, 2013 after the analysis was complete, this option has not been given a RW budget, scored or ranked in the following sections.

The *annual* RW demand of all the options combined equals 2,072 mg/yr (6,358 af/yr), which is 14% more than the 1,825 mg/yr (5,600 af/yr) conservatively projected to be available (Figure 9).

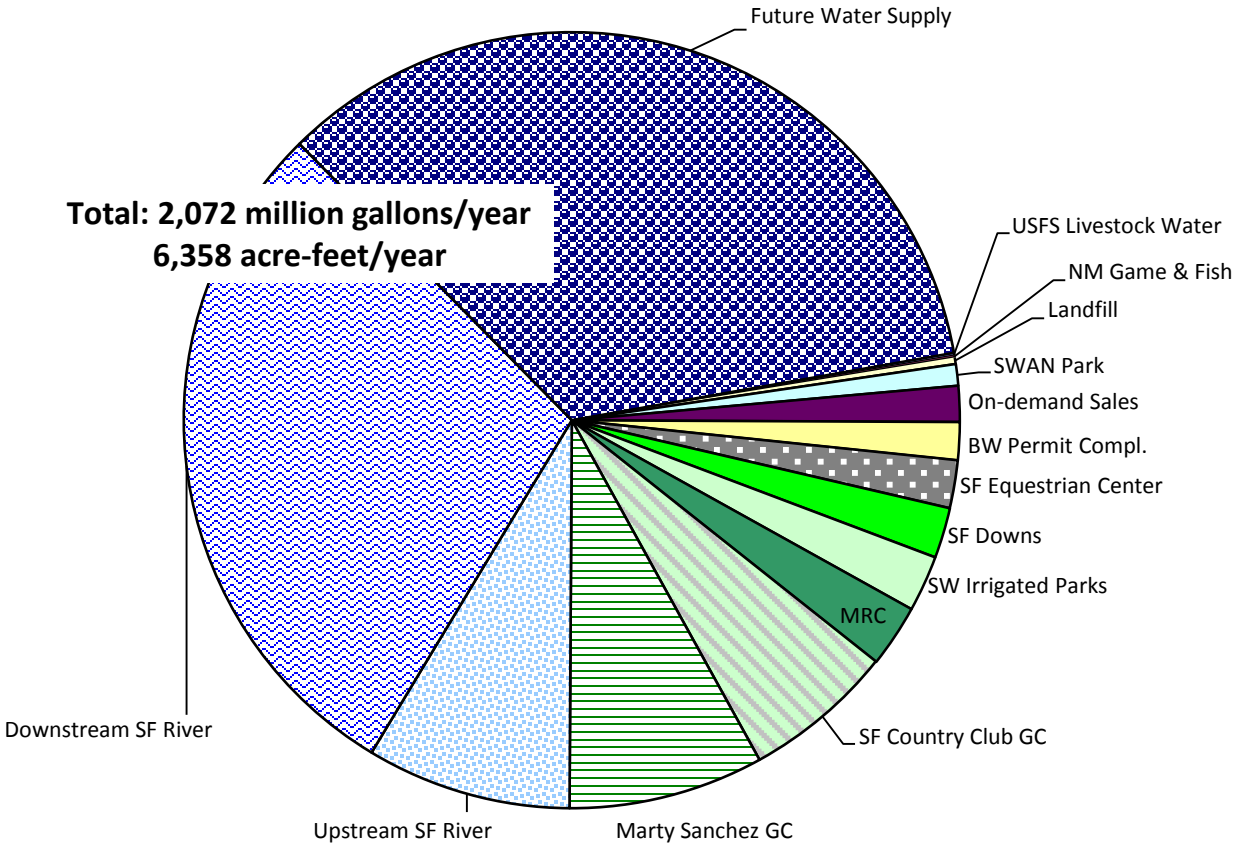


Figure 9. Annual total and relative proportion of all reclaimed wastewater use options combined

The demand for monthly and daily RW is even greater. The combined monthly demand for all the options except RW for potable water supply is 213 mg/d (Table 2), 40% more than the RW available and the combined *daily* demand of all the options (except RW for potable water) supply is 6.9 mg/d (Table 2), 38% more than the available amount. Hence, RW demand is greater than available supply under current average conditions, which will only worsen under drier hotter drought and projected climate change-impacted conditions, and become more pronounced during high seasonal demand.

5.4 Revenue Generation from Reclaimed Wastewater Options

As shown in Figure 10, only 2% of the City's RW currently generates revenue in the amount of approximately $121,000 annually. If all of the RW currently used were sold at the current rate of $3.03 per 1000/gallons, the resource could generate $1.4 million. Since 2012, one of the largest RW revenue sources, CLCI, no longer pays $300,000 to $400,000 annually to the WWMD.

The Future of Water Adjudications in New Mexico

Gregory C. Ridgley, Office of the State Engineer

Greg is the Deputy Chief Counsel for the New Mexico Office of the State Engineer, where he coordinates the work of the hydrographic survey staff and Special Assistant Attorneys General of the OSE Litigation and Adjudication Program who represent the State of New Mexico in the 12 water rights adjudication suits currently pending in New Mexico's state and federal courts. During his 12 years at the OSE, he has worked with Indian Pueblos and Nations, federal agencies, local governments, acequias, and private individuals to resolve water right claims through negotiation or litigation. He received his BA from Harvard University in 1984, and his JD from the University of California, Hastings College of the Law in 1992. He lives with his wife and two spirited teenagers in Santa Fe. In addition to cheering for his kids on field and stage, he roots for the Boston Red Sox and San Francisco Giants.

Good morning. Before I start, I first would like to say a word of thanks to Judge Valentine. We just heard that the Judge is retiring at the end of the year, after presiding over the Lower Rio Grande water rights adjudication for over a decade. I have appeared before Judge Valentine myself many times. I have also worked with Judge Valentine on many matters relating to adjudications over the years, and I've always appreciated the strength of his commitment to improving adjudications in New Mexico, and his tireless efforts to do so. So I would like to thank him on behalf of all New Mexico water right owners – and all the citizens of the state – for his distinguished service in this challenging but very important field. Thank you, Judge.

As we all know, New Mexico state government is in an era of tight budgets. Today I will discuss what that means for water rights adjudications. The resources available to work on adjudications will be the most important factor in the next few years on how much progress we make in these cases. I will address four specific topics today: first, provide a brief overview of adjudications; second, review the budget of the Litigation and Adjudication Program (LAP) of the Office of the State Engineer (OSE) and what that means in terms of people and other resources available to work on adjudications; third, introduce the annual Rule 71.3 Report, which describes the State's priorities and resource allocations for pending water rights adjudications in the coming fiscal year; and finally, wrap up with a brief discussion of lessons we have learned from our experience prosecuting adjudications and how we can work smarter to achieve lasting incremental progress in adjudications.

Adjudications Overview

In the handouts we passed out you should have received a copy of this map (Fig. 1); on the back of the map you'll see there is a chart presenting some summary statistics (Fig. 2). These provide a very high-level overview of water rights adjudications in New Mexico. The map shows in red adjudications that over the years have been completed to a final decree, and in green the adjudications that are currently pending. There are 12 water rights adjudication suits pending today in the state and federal courts, half in the state courts and half in the federal courts.

Let me take a moment here to explain what a water rights adjudication suit is, because I don't think this is always clearly understood. Although adjudications get a fair amount of attention from the press and the legislature, the public is often unclear on the difference between adjudications and other litigation involving water rights. The State Engineer supervises the appropriation of the waters of the state largely through permits that he issues. If someone is unhappy with the permit they receive then they can request an administrative appeal before the State Engineer, and if they don't like that decision then they can appeal that to the district court. We have attorneys and hydrologists and other technical staff who work on those

Figure 1. Map of New Mexico water rights adjudications

appeals from State Engineer permits, and those appeals can involve litigation in district court, but those suits are not adjudications. Adjudications are distinct, specialized legal proceedings in district court to comprehensively determine all water rights in a given stream system. Whereas the parties to an appeal of a State Engineer permit are typically the permittee, the State Engineer, and perhaps a handful of protestants, the parties to a water rights adjudication are the hundreds or thousands of owners of water rights in the stream system being adjudicated.

Figure 2 shows just how large these suits are: the 12 pending adjudications have a combined total of around 72,000 defendants. These are big and cumbersome cases, and they take a lot of time as a result. The Pecos is by far the largest in terms of geographic area, while the Lower Rio Grande has the largest number of defendants and water rights involved. Figure 2 shows the differences in the number of defendants in each of the 12 suits. These suits also vary greatly in terms of age – the Pecos adjudication has been pending for over 50 years, while the Animas, the newest, is only a few years old. The handout also provides statistics on the number of acres and subfiles adjudicated in each case that show the varying stages of completion of the different suits.

Figure 1 shows the locations and different geographic areas covered by the 12 pending adjudications. Probably the most notable thing shown on this map is something that Judge Valentine mentioned: there is no adjudication currently pending for the Middle Rio Grande. The area cross-hatched in blue on the map along the Rio Grande from Cochiti down to Elephant Butte shows the likely geographic scope of a future Middle Rio Grande adjudication. Periodically over the years we have heard calls to initiate this adjudication. There is no debate that it is the most significant area of the state where an adjudication suit has yet to be filed. When it is eventually started it will be the most challenging and resource demanding adjudication New Mexico has ever attempted. It is precisely because it will demand so many resources that the State Engineer and his Chief Counsel DL Sanders and I have consistently made clear in our public statements over the years that we need to finish several of the currently pending adjudications before we will have the resources available to be able to take on a new adjudication of the magnitude of the Middle Rio Grande.

When discussing the progress that New Mexico has made in adjudications, an estimate frequently cited is that about 20 percent of water rights in the state have been adjudicated. I think that estimate is too low. On the map in Figure 1, the completed adjudications shown in red cover about 20 percent of the geographic area of the state that needs to be adjudicated. Beyond these completed adjudications, the only geographic areas of the state left to be adjudicated are the 12 pending adjudications shown in green and the areas for future adjudication shown in blue cross-hatching. The 12 currently pending adjudications cover over 60% of the geographic area of the state that needs to be adjudicated. (Areas on the map that are not outlined in either red, green, or blue do not have significant numbers of water rights developed from surface water, and therefore will not need to be subject to a stream system adjudication suit.) The statistics in Figure 2 show that of the total irrigated acreage at issue in the 12 pending adjudications, about 67% has been adjudicated with a subfile order. So by that measure, at least, the 12 pending adjudications are about 2/3 complete. If we put that together with the adjudication suits that have already been completed to a final decree (shown in red on the map), I think a better estimate is that we have adjudicated between 40 and 50% of the state's water rights that need to be adjudicated.

Another gauge of progress in water rights adjudications in recent years is provided by the performance measures set by the legislature for LAP. The next two figures present these performance measures. Figure 3 shows over the last seven years how many people in the 12 pending adjudications have been served with what is known as an offer of judgment to determine their water right. Service of this document initiates the process before the court that culminates in an individual subfile order adjudicating a water right. Beginning in fiscal year 2004, a total of a little over 2,000 people had been served with an offer of judgment. Over the last seven years we have raised that total to 13,000. So in seven years, the adjudication process was initiated for 11,000 people who own water rights. Figure 4 presents our results for the performance measure that measures the number of subfiles in the 12 pending adjudications that have received individual subfile orders that adjudicate a water right. This figure shows the steady progress we have made over the last seven years; by this measure, by fiscal year 2010 close to 50% of all water rights in these pending suits have been adjudicated by final subfile order.

STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER

Acres Adjudicated, Subfiles, and Defendants in Pending New Mexico Adjudications
Totals and Estimates as of June 30, 2010

NORTHERN NEW MEXICO ADJUDICATIONS

Stream System	Total Acres	Adjudicated Acres	% Acres Adjudicated	Subfiles	Defendants
San Juan	37,829	3,991	11%	9,000	11,400
Jemez	2,033	2,033	100%	1,011	1,095
Red River	12,185	12,185	100%	1,202	1,605
Zuni	980	-	0%	950	1,000
Rio San Jose	undetermined	-	0%	1,800	2,000
Rio Chama	34,889	34,329	98%	3,655	4,626
Taos/Hondo	13,756	13,692	100%	4,026	5,224
Santa Cruz/Truchas	7,218	7,218	100%	3,446	5,139
Nambe/Pojoaque/Tesuque	2,755	2,747	100%	3,430	5,598
Santa Fe	827	612	74%	1,284	1,550
Subtotals	**112,472**	**76,807**	**68%**	**29,804**	**39,237**

SOUTHERN NEW MEXICO ADJUDICATIONS

Stream System or LRG Section	Total Acres	Adjudicated Acres	% Acres Adjudicated	Subfiles	Defendants
Animas Underground	15,912	-	0%	300	500
Nutt Hockett	11,554	11,554	100%	43	73
Rincon Valley	21,964	17,180	78%	1,227	1,429
Northern Mesilla	20,032	3,493	17%	5,884	7,422
Southern Mesilla	53,923	10,140	19%	5,320	7,203
Outlying Areas	3,801	283	7%	1,233	1,738
Subtotals	**127,186**	**42,650**	**34%**	**14,007**	**18,365**

PECOS ADJUDICATION

Section	Total Acres	Adjudicated Acres	% Acres Adjudicated	Subfiles	Defendants
Gallinas	8,162	6,841	84%	1,680	1,994
Upper Pecos(Ground Water)	685	660	96%	99	92
Upper Pecos(Surface Water)	undetermined	-	0%	undetermined	2,000
Pecos Supplemental/Misc.	4,651	365	8%	49	100
Hondo Basin	6,748	6,739	100%	588	657
FSID	6,500	-	0%	undetermined	480
Fort Sumner(Ground Water)	7,444	7,444	100%	80	44
PVACD	128,274	123,032	96%	1,900	2,522
River Pumpers	6,063	6,063	100%	19	22
Carlsbad Underground	11,350	320	3%	320	240
Carlsbad Irrigation District	27,053	26,912	99%	1,109	1,328
Penasco	undetermined	-	0%	undetermined	5,000
Subtotals	**206,930**	**178,376**	**86%**	**5,844**	**14,479**

ACTIVE GRAND TOTALS	**446,588**	**297,833**	**67%**	**49,655**	**72,081**

Figure 2. New Mexico adjudication summary statistics

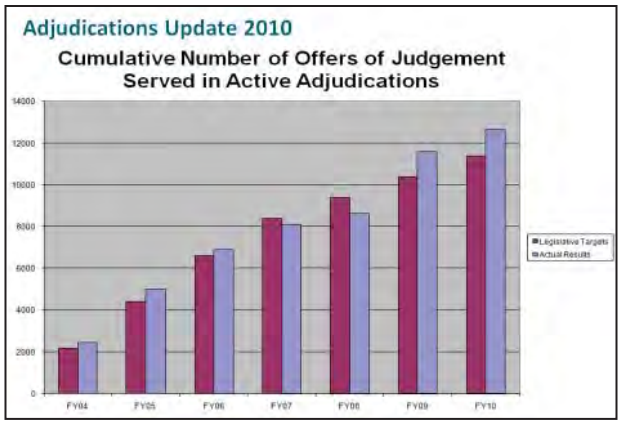


Figure 3. Offers of judgment served in 12 pending adjudications

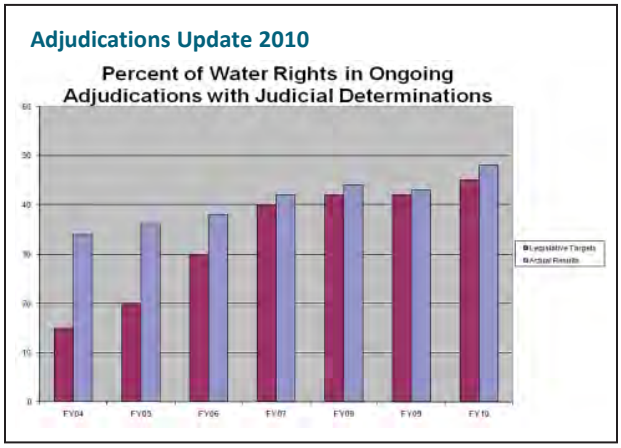


Figure 4. Percent of water rights adjudicated in ongoing adjudications

Figure 5 shows the progress we can make when we are able to focus resources on a single adjudication without interruption. The data are for sections 3, 5, and 7 of the Chama adjudication, where for the last ten years we have been able to dedicate a single attorney, supported by hydrographic survey staff, to move the suit forward. The darker blue bars show the total number of subfiles in these three sections of the adjudication, while the light blue bars show the subfiles that have been adjudicated by subfile order entered by the court. As you can see on the right side of the chart, subfile work is now almost complete, and this year and next we will be focusing on *inter se* proceedings and the entry of partial final decrees for these three sections of the Chama.

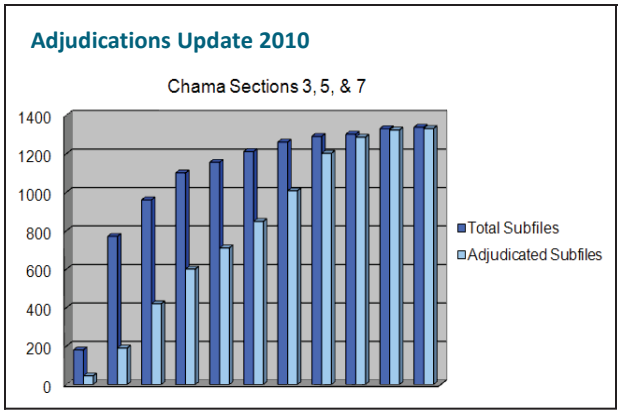


Figure 5. Subfiles adjudicated in Chama sections 3, 5, & 7

OSE LAP Budget and Resources Available for Adjudications

The difficult budget climate and its impact on LAP staffing levels is limiting our ability to make progress in adjudications, and likely will continue to do so in the next few years. But the resource problems we have encountered are more complicated than a simple matter of the dollar amounts budgeted by the legislature.

The budget amounts set by the legislature for the current fiscal year have not significantly affected the resources available to LAP for adjudication work. Figure 6 compares LAP's budget for the current fiscal year 2011, which began July 1, 2010, to our budget for the previous fiscal year 2010. The legislature appropriates LAP's budget in three basic areas: salary and benefits, contracts, and all other expenses. You can see that the budget amount for salary and benefits – the amount budgeted for LAP to pay employees – is basically flat. It was not reduced in FY 2011 from the amounts budgeted in FY 2010. You can also see that the amount budgeted to LAP for contracts was reduced in FY 2011 by 15% from the FY 2010 level. That has had an impact, because we employ contract attorneys to work on adjudications. The majority of our attorneys working on adjudications are salaried agency employees, but we do employ some contract attorneys with specialized expertise in areas like Indian water rights. The reduction in our contractor budget has directly reduced our ability to use contract attorneys to work on adjudications. But because LAP's salary and benefits budget has not been reduced, the overall impact of the budget reductions has been only moderate.

LAP Budget and Staffing

Budget Appropriation Amounts - FY11 compared to FY10

Salary & Benefits	Flat
Contractors	<15%>
All Other Costs	< 4%>

Figure 6. LAP budget - FY11 vs. FY10

Our real resource problem has been that even though we have enjoyed close to flat budgets on paper over the last two fiscal years, we have suffered significant shortfalls in actual funds received to pay those budgeted amounts, and these shortfalls have left us unable to fill vacancies when staff leave the agency. This problem started with House Bill 1110 passed by the legislature a few years ago. The idea of that bill was to provide additional funding from the water project fund to the OSE to work on adjudications, over and above our base general fund budget. Unfortunately, the moment that additional funding was added to our budget, the legislature took away an equivalent amount of general fund money. This left our overall budget flat, which doesn't sound so bad, but Figure 7 shows the real problem it caused. Our budget for salary and benefits in the current fiscal year was $4.86 million. Of that total, $3.4 million was appropriated from severance tax bond proceeds in the water project fund. But because those severance tax bonds only generated $2.7 million, we were left with a shortfall of $700,000.

LAP Budget and Staffing

- HB 1110
- FY11 LAP Salary & Benefits budget shortfall

Total Budget:	$4.86 M
STB Proceeds (Budgeted):	$3.40 M
STB Proceeds (Actual):	$2.69 M
Shortfall:	<$ 700 K>
(14.5% of $4.86M)	

Figure 7. LAP FY11 salary and benefits shortfall

Because of that $700,000 funding shortfall, we have not been able to fill vacancies as agency employees leave for other opportunities. Since November, 2008 the Governor has imposed a hiring freeze on state agencies. While there has been a lot of reporting in the press that this hiring freeze has been very porous, that has not been the case for LAP. Because of the $700,000 funding shortfall, we have not been able to request an exemption to the hiring freeze, and so we have not been able to fill any vacancies. Figure 8 shows the resulting impact over the last 18 months. On the left is fiscal year 2010 and the right is fiscal year 2011. These little icons represent the attorney and hydrographic survey positions in LAP. These are not all the positions in LAP, just the core technical and legal positions that are assigned to our four main adjudication bureaus. We have a total of 43 of these adjudication positions in LAP. At the beginning of fiscal year 2010, only four of these 43 positions were vacant – a nine percent vacancy rate. Those four vacancies are shown as the little "ghost" icons in gray on the end of the rows. Today, in the middle of fiscal year 2011, we have a lot more ghosts: 14 of the 43 positions are now vacant – a 33% vacancy rate. With 33% of our core adjudication technical and legal positions now vacant, our capacity to work on adjudications has been reduced by almost 25% over the last 18 months. That has had an unavoidable, direct impact on our ability to make progress in adjudications.

LAP Budget and Staffing

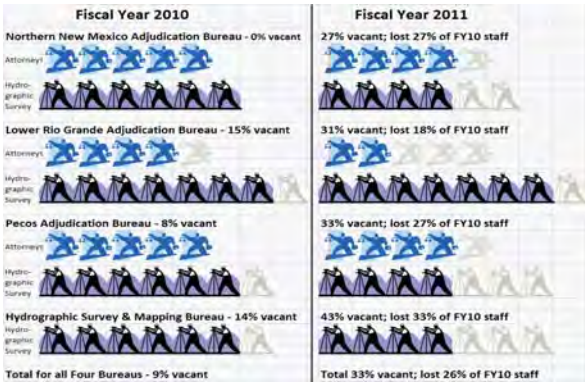


Figure 8. Vacancies in LAP technical and legal positions

Rule 71.3 Report

Rule 71.3 is a rule of civil procedure recently adopted by our Supreme Court. It requires all the state court judges presiding over adjudications and the attorneys representing the state in those suits to get together once a year for a working session. The purpose of the working session is to discuss the state's resources available to prosecute adjudications and the state's priorities for adjudication work in the coming fiscal year. For this meeting the state's attorneys prepare a report that outlines all the resources we have to work on adjudications and how those resources are going to be allocated in the coming fiscal year. Figure 9 shows a sample of a page from that report. This report is the most detailed description we provide every year on resources and the prioritization of adjudication work. It is an essential tool for communicating these matters to the public and the courts.

LAP Budget and Staffing

Matters to be completed lists

- **Lower Rio Grande**
- **Pecos**
- **Northern NM**

http://www.ose.state.nm.us/legal_ ose_adjudication.html

Figure 9. Rule 71.3 report

Of course, things change, and at the time the report is compiled at the beginning of the fiscal year we cannot anticipate every development during the year. For example, we received some wonderful good news this week. On Tuesday, November 30, 2010, the House of Representatives passed the legislation authorizing and funding the federal portion of the Aamodt and Taos Pueblo Indian water rights settlements. (On December 8, 2010 President Obama signed the bill, the Claims Resolution Act of 2010, into law as Public Law 111-291). This is wonderful news for New Mexico and an extraordinary achievement by our congressional delegation. But it is also one of those "be careful what you ask for" situations, because those settlements are now going to impose new deadlines upon the Aamodt and Taos adjudications to get things done to be able to get those decrees entered. That may require some reallocation of resources to achieve those new deadlines.

Lessons Learned

Finally, let me present some lessons we have learned from our experience prosecuting adjudications. This is adapted from a talk I gave to the adjudication judges at our Rule 71.3 working session earlier this year. It is an attempt to boil down our experience to a set of principles that describe the best way to make lasting, incremental progress in adjudications, regardless of the amount of resources we have available. Given the nature of adjudications in New Mexico and the resource limitations we face, I think these principles are going to be important for years to come. This presentation is structured as a light-hearted parody of "All I Really Need to Know I Learned in Kindergarten," but the principles it tries to present are serious.

1. The first and most important principle is that we need to finish what we started before moving on to something new. By that we mean that we must focus on achieving incremental progress by resolving discrete matters with finality before we move the resources involved on to other matters. For example, when we start subfile work in a section or subsection of an adjudication, we need to complete the adjudication of all rights in that section or subsection before we move those resources elsewhere. It has been a recurring problem over the decades that after starting work on one adjudication or section of an adjudication, another pressing matter forces us to pull those resources away. When we finally are able to allocate those resources back to the first adjudication, we have to do even more work to bring matters back to where they were when we left it. This principle also applies at the highest level. As I mentioned earlier, we can't afford to start a new adjudication now for the Middle Rio Grande until we have finished several of our pending adjudications.

2. Second, cookies are best warm out of the oven, by which we mean that we need to schedule both hydrographic survey and adjudication subfile work to minimize the chance that the data and information in the hydrographic survey will grow old and become stale. Judge Valentine made this point very well and I agree with him that this is something we need to do better. We need to work smarter and schedule our survey work so that

as soon as it is completed we are ready to begin working on the adjudication of subfiles.

The Judge's comments also touched on another point related to this one. We've learned that when we join individual defendants to the adjudication, we should not join defendants en masse, thousands at a time. Instead, we should be joining them only when we are ready to work on their individual subfile. Joining water right owners as defendants and then taking no other action in the adjudication on their subfiles for months or years only creates confusion, misunderstandings, and more problems down the road.

3. Third, don't bite off more than you can chew, by which we mean that we must focus our limited technical and legal resources and avoid over-committing those resources. This principle applies both across adjudications and within each adjudication. Across adjudications, we strive to focus our resources on a few adjudications rather than spreading our resources thinly across all pending adjudications. The annual Rule 71.3 working session with the judges is an important opportunity to communicate to the judges and adjudication defendants where we plan to focus our adjudication work in the coming year. Within adjudications, we divide the adjudication into sections and focus our resources on one or two sections at a time.

4. The last principle is to play fair, share, and not hit people. We have advocated this approach before the legislature several times in recent years; this is sometimes referred to as the "Chama adjudication model." The idea here is to promote the informal, out-of-court resolution of subfile disputes over the formal litigation of those disputes. We do that by minimizing the adversarial aspects of water rights adjudications. These are civil lawsuits, and so they are necessarily adversarial at some level. It's intimidating to the average person, for example, to receive a summons and be forced to answer the State's adjudication complaint. But we have learned we can make more progress in adjudications when we minimize the formal litigation of disputes and instead work to resolve disputes informally and promote an atmosphere where there is an open exchange of information between the state and individual defendants. We can do that by a variety of techniques, including public outreach and education, mandatory field offices where the State's legal and technical representatives meet with individual defendants, and follow up field checks by hydrographic survey staff when requested by defendants.

To conclude, I've outlined the fundamental principles we have identified that promote the achievement of incremental and lasting progress in adjudications. Today, at a time where resources are at a premium, it is more important than ever to work smart. These principles are scalable – they can be applied at different levels of resources and they will produce results in any budget climate – but they are even more important in our current difficult budget climate.

Attachment #6: NMED Water Quality Control Commission Regulations - Ground and Surface Water Protection

Excerpt from:

TITLE 20 ENVIRONMENTAL PROTECTION
CHAPTER 6 WATER QUALITY
PART 2 GROUND AND SURFACE WATER PROTECTION

20.6.2.1201 NOTICE OF INTENT TO DISCHARGE:

A. Any person intending to make a new water contaminant discharge or to alter the character or location of an existing water contaminant discharge, unless the discharge is being made or will be made into a community sewer system or subject to the Liquid Waste Disposal Regulations adopted by the New Mexico Environmental Improvement Board, shall file a notice with the Ground Water Quality Bureau of the department for discharges that may affect ground water, and/ or the Surface Water Quality Bureau of the department for discharges that may affect surface water. However, notice regarding discharges from facilities for the production, refinement, pipeline transmission of oil and gas or products thereof, the oil field service industry, oil field brine production wells, geothermal installations and carbon dioxide facilities shall be filed instead with the Oil Conservation Division.

B. Any person intending to inject fluids into a well, including a subsurface distribution system, unless the injection is being made subject to the Liquid Waste Disposal Regulations adopted by the New Mexico Environmental Improvement Board, shall file a notice with the Ground Water Quality Bureau of the department. However notice regarding injection to wells associated with oil and gas facilities as described in Subsection A of Section 20.6.2.1201 NMAC shall be filed instead with the Oil Conservation Division.

C. Notices shall state:

(1) the name of the person making the discharge;
(2) the address of the person making the discharge;
(3) the location of the discharge;
(4) an estimate of the concentration of water contaminants in the discharge; and
(5) the quantity of the discharge.

D. Based on information provided in the notice of intent, the department will notify the person proposing the discharge as to which of the following apply:

(1) a discharge permit is required;
(2) a discharge permit is not required;
(3) the proposed injection well will be added to the department's underground injection well inventory;
(4) the proposed injection activity or injection well is prohibited pursuant to 20.6.2.5004 NMAC.

[1-4-68, 9-5-69, 9-3-72, 2-17-74, 2-20-81, 12-1-95; 20.6.2.1201 NMAC - Rn, 20 NMAC 6.2.I.1201, 1-15-01; A, 12-1-01]

Evaluation of Different Methods to Calculate Heavy-Truck VMT

Final Report—December 2004

Sponsored by

University Transportation Centers Program,
U.S. Department of Transportation
(MTC Project 2002-02)

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16. Abstract

Reliable estimates of heavy-truck volumes are important in a number of transportation applications. Estimates of truck volumes are necessary for pavement design and pavement management. Truck volumes are important in traffic safety. The number of trucks on the road also influences roadway capacity and traffic operations. Additionally, heavy vehicles pollute at higher rates than passenger vehicles. Consequently, reliable estimates of heavy-truck vehicle miles traveled (VMT) are important in creating accurate inventories of on-road emissions.

This research evaluated three different methods to calculate heavy-truck annual average daily traffic (AADT) which can subsequently be used to estimate vehicle miles traveled (VMT). Traffic data from continuous count stations provided by the Iowa DOT were used to estimate AADT for two different truck groups (single-unit and multi-unit) using the three methods. The first method developed monthly and daily expansion factors for each truck group. The second and third methods created general expansion factors for all vehicles.

Accuracy of the three methods was compared using *n*-fold cross-validation. In *n*-fold cross-validation, data are split into *n* partitions, and data from the *n*th partition are used to validate the remaining data. A comparison of the accuracy of the three methods was made using the estimates of prediction error obtained from cross-validation. The prediction error was determined by averaging the squared error between the estimated AADT and the actual AADT.

Overall, the prediction error was the lowest for the method that developed expansion factors separately for the different truck groups for both single- and multi-unit trucks. This indicates that use of expansion factors specific to heavy trucks results in better estimates of AADT, and, subsequently, VMT, than using aggregate expansion factors and applying a percentage of trucks. Monthly, daily, and weekly traffic patterns were also evaluated. Significant variation exists in the temporal and seasonal patterns of heavy trucks as compared to passenger vehicles. This suggests that the use of aggregate expansion factors fails to adequately describe truck travel patterns.

17. Key Words	18. Distribution Statement
cross-validation—expansion factors—heavy trucks—heavy-truck emission inventories—multi-unit truck—permanent continuous count—short-term count—single-unit truck	No restrictions.

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EVALUATION OF DIFFERENT METHODS TO CALCULATE HEAVY-TRUCK VMT

MTC Project 2002-02

Final Report
December 2004

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EXECUTIVE SUMMARY

Reliable estimates of heavy-truck volumes are important in a number of transportation applications. Estimates of truck volumes are necessary for pavement design and pavement management. They also affect bridge performance. Truck volumes are important in traffic safety. The number of trucks on the road also influences roadway capacity. Heavy trucks have more difficulty accelerating and maneuvering than passenger cars and have a lower deceleration in response to braking compared to passenger cars. They are particularly affected by grade. As a result, the number of heavy trucks present in the traffic stream influences traffic operations. Additionally, heavy vehicles pollute at higher rates than passenger vehicles. Consequently, reliable estimates of heavy-truck vehicle miles traveled (VMT) are important in creating accurate inventories of on-road emissions.

Most states use a traffic-count-based method for estimating truck VMT. One method used to estimate truck VMT involves developing separate expansion factors for specific classes of heavy vehicles. Annual average daily traffic (AADT) from shorter term classification counts for a class of heavy vehicles is factored up using the expansion factors. Truck VMT for a highway segment is obtained by multiplying truck AADT by the length (centerline mileage) of a roadway section. This method however is resource-intensive, and, therefore, most DOTs use a more aggregate method to derive truck VMT. In this aggregate method, generic expansion factors are developed that apply to all vehicle classes. A limited number of vehicle classification counts are used to calculate truck percentages. For short-term counts, the expansion factors are applied and AADT for all vehicle types is estimated. VMT is calculated by multiplying AADT by the section length. Truck VMT is calculated by multiplying total VMT by the average truck percentages (by truck types) obtained from limited classification counts. Truck percentage may also be determined from short-term counts.

Several studies have indicated problems with the use of generic expansion factors for estimating truck VMT or volumes. Although truck volumes, like passenger car volumes, vary over time and space, the pattern of temporal variability in truck volumes differs significantly from passenger vehicles. Trucks experience more variability between weekdays and weekends than passenger vehicles, and expansion factors derived from aggregate count data may fail to adequately explain temporal variations in truck traffic.

This research evaluated three different methods to calculate heavy-truck AADT which can subsequently be used to estimate VMT. Traffic data from continuous count stations provided by the Iowa DOT were used to estimate AADT for two different truck groups (single-unit and multi-unit) using the three methods. The first method developed monthly and daily expansion factors for each truck group. Truck AADT was calculated by applying truck expansion factors to short-term counts. The second and third methods created general expansion factors for all vehicles. Truck AADT was calculated by multiplying short-term counts by generic expansion factors and truck percentages. Truck percentages for the second method were based on the annual percentage of trucks for each group from continuous count stations. The third method used daily truck percentages from short-term counts.

Accuracy of the three methods was compared using *n*-fold cross-validation. In *n*-fold cross-validation, data are split into *n* partitions, and data from the *n*th partition are used to validate the

remaining data. Accordingly, data from continuous count stations were divided into four groups, and each group was reserved for one partition as the validation dataset. Short-term counts were extracted from the validation dataset and then AADT was estimated using each of the three methods. Actual AADT by truck group for each count station was compared to the estimated AADT by truck group for each method.

Data were analyzed for rural primary and interstate roadways. Data from continuous count stations for the 2001 counting year were used. Although 2002 data were available, the DOT felt that there had been significant problems with the data and suggested use of the 2001 data. Data were analyzed for two truck categories: single-unit (SU) trucks and multi-unit (MU) trucks. The single-unit truck category included FHWA vehicle classes 4 to 7, and the multi-unit truck category included FHWA vehicle classes 8 to 13.

A comparison of the accuracy of the three methods was made using the estimates of prediction error obtained from cross-validation. The prediction error was determined by averaging the squared error between the estimated AADT and the actual AADT. Overall, the prediction error was the lowest for the method that developed expansion factors separately for the different truck groups for both single- and multi-unit trucks. This indicates that use of expansion factors specific to heavy trucks results in better estimates of AADT, and, subsequently, VMT, than using aggregate expansion factors and applying a percentage of trucks.

Monthly, daily, and weekly traffic patterns were also evaluated. Significant variation exists in the temporal and seasonal patterns of heavy trucks as compared to passenger vehicles. This suggests that the use of aggregate expansion factors fails to adequately describe truck travel patterns.

1. BACKGROUND

1.1 Heavy-Truck VMT

Information about truck volumes is necessary to meet federal reporting requirements and to assist state and local agencies in assessing system performance and needs. Estimates of vehicle miles traveled (VMT) are used for a variety of transportation-related planning and policy analysis purposes. VMT is a measure of the amount of travel along a roadway section for a specified time period. VMT is a function of the number of trips made as well as the lengths of those trips.

VMT estimates are used extensively in transportation planning to estimate vehicle emissions, compute energy consumption, assess traffic impact, allocate highway funds, and estimate pavement performance (Kumapley et al. 1996). Estimates of VMT by vehicle class are required to derive accident rates by vehicle class, compare accident rates across classes, and to allocate highway costs across vehicle classes (Weinblatt 1996). For VMT-related revenue, estimates of VMT by vehicle class are required for producing estimates of revenue forecasts for proposed new taxes, tax payments by vehicle class (for equity analyses), and revenue that should be collected. The U.S. economy thrives significantly on freight transportation, which takes place mostly by truck (Mohamedshah et al. 1993). Estimates of truck VMT are therefore necessary to understand the importance of trucks to the nation's economy and to evaluate the costs and benefits of potential changes in truck regulation (Weinblatt 1996). Estimates of truck volumes are also an essential input in geometric and structural design of roadways and bridges.

Trucks have characteristics that differ from passenger vehicles. Typically, trucks are larger in size and much heavier than passenger vehicles, thus influencing roadway capacity and pavement performance. Trucks are also characterized by less effective acceleration and maneuvering capabilities and have a lower deceleration in response to braking than passenger cars (Mohamedshah et al. 1993). These characteristics need to be accommodated in geometric and pavement design of roadways to facilitate smooth traffic operations. Estimates of truck VMT therefore serve as vital input in geometric and pavement design of roadways. Truck VMT is also a key factor in traffic safety. VMT estimates by vehicle class are required to derive accident rates by vehicle class and compare accident rates across vehicle classes. According to the 2003 Traffic Safety Facts published by the National Highway Traffic Safety Administration (NHTSA), 12% of all the traffic fatalities reported in 2003 resulted from collisions involving large trucks (gross vehicle weight rating greater than 10,000 pounds), yet trucks accounted for only 8% of the total VMT. A better understanding of where trucks are located on the highway system may assist in evaluating the causes of truck-related crashes and consequently minimize fatalities and injuries resulting from such crashes. These important applications of heavy-truck VMT warrant its accurate estimation. Previous research has, however, revealed that current methods used in the estimation of heavy-truck VMT are often less accurate than those used for passenger vehicles. There is, therefore, the need to improve current heavy-truck VMT estimation methods by reducing or possibly eliminating inherent biases.

Each state maintains a traffic count program to collect volume data continuously at permanent count stations sites. Classification counts may also be collected at a limited number of permanent count stations. Daily and monthly expansion factors are calculated from permanent counts. Factors are typically generated for each day of the week by month for separate road types. Portable or short-term counts are collected at other locations to estimate site specific volumes. Short-term counts are usually collected for periods up to 48 hours. Since short-term counts do not represent an average annual daily count, the short-term count data is multiplied by expansion factors to estimate annual average daily traffic (AADT) and VMT. To account for temporal variations in short-duration traffic counts, data from sites that are counted continuously are used to develop expansion factors for factoring short-duration counts to estimates of AADT. Vehicle classification data are used to estimate AADT and VMT by vehicle class. VMT is the product of volume and section length and is usually reported as the total amount of travel in a day (daily vehicle miles traveled) or in a year (annual vehicle miles traveled).

About 70% of state DOTs, including the Iowa DOT, use a traffic-count-based method for estimating truck VMT (Benekohal and Girianna 2002). One method to estimate truck VMT is to develop separate expansion factors for specific classes of heavy vehicles. AADT from short-term classification counts for a class of heavy vehicles is factored up using the expansion factors. Truck VMT for a highway segment is obtained by multiplying truck AADT by the length (centerline mileage) of a roadway section. This method however is resource-intensive, and most DOTs use a more aggregate method to derive truck VMT. In this method, generic expansion factors are developed that apply to all vehicle classes. A limited number of vehicle classification counts are used to calculate truck percentages. For short-term counts, the expansion factors are applied and AADT for all vehicle types is estimated. VMT is calculated by multiplying AADT by the section length. Truck VMT is calculated by multiplying total VMT by the average truck percentages (by truck types) obtained from limited classification counts. Truck percentage may also be determined from short-term counts.

Several studies have indicated problems with the use of generic expansion factors for estimating truck VMT or volumes. Although truck volumes, like passenger car volumes, vary over time and space, the pattern of temporal variability in truck volumes differs significantly from that in passenger vehicles. Trucks experience more variability between weekdays and weekends than passenger vehicles. As such, adjustment factors derived from aggregate count data (total volume) may fail to adequately explain temporal variations in truck traffic culminating in biased estimates of annual average daily truck traffic (AADTT). Hu et al. (1998) evaluated extrapolated data from permanent count stations and reported that more precise estimates resulted for passenger vehicles than for heavy trucks and that estimates were more precise when volumes were high. Stamatiadis and Allen (1997) reported that trucks experience more seasonal variability than passenger vehicles. They also observed more variability between weekdays and weekends for heavy trucks than for passenger vehicles. Both factors are difficult to capture with current extrapolation methods. Hallenbeck (1993) also observed that trucks do not exhibit the same seasonal patterns as passenger vehicles. As a result, seasonal estimates based on aggregate count data may fail to adequately explain seasonal variations in truck flow.

Weinblatt (1996) also indicated that, although extrapolated traffic counts can be quite accurate in estimating VMT for systems of roads, less sophisticated methods are often used to estimate VMT by vehicle class resulting in less satisfactory results. Researchers recommended using seasonal and day-of-week factors developed for several groups of vehicle classes to better reflect heavy-truck patterns and to reduce errors in heavy-truck AADT estimates. Additionally, extrapolation methods, such as the Highway Performance Monitoring System (HPMS) method, were designed for federal-aid roads but are not as applicable to local roads (Kumapley and Fricker 1996).

1.2 Problem Statement and Scope of Work

VMT and vehicle classification are vital inputs in the design and operation of an efficient transportation infrastructure system. In particular, heavy-truck VMT is important as the number of heavy vehicles on a road affects traffic operations, safety, and pavement performance. Research has revealed, however, that current methods used in the estimation of heavy-truck VMT are often less accurate than those used for passenger vehicles. Consequently, the goal of this research was to evaluate existing methods used by state DOTs, identify deficiencies, and make recommendations on reducing uncertainties in heavy-truck VMT estimates.

Current heavy-truck AADT estimation methods were evaluated and compared. Traffic data from permanent counting stations provided by the Iowa DOT were used to develop a statistical model to compare different traffic count–based methods. Although VMT is often the metric of interest, AADT was evaluated for this study since VMT is dependent on AADT estimates and can easily be derived once AADT is estimated. Recommendations on reducing uncertainties in heavy-truck AADT were made.

This research focuses on heavy-truck AADT and VMT. Heavy trucks are defined as the aggregation of all vehicles belonging to classes 4 to 13 of the FHWA 13-class vehicle classification scheme. The FHWA vehicle classification scheme with the definitions of the various classes of vehicles is presented in Appendix A. In this report, the term “truck” is used interchangeably with the term “heavy truck.”

2. INTRODUCTION

2.1 Methods of Estimating VMT

AADT and VMT estimation methods can be classified into two broad divisions. The two methods are non–traffic count based and traffic count based. Each is discussed in the following sections.

2.1.1 Non-Traffic-Count-Based Method

The non-traffic-count-based method for estimating AADT and VMT uses non-traffic data such as socio-economic data, including fuel sales, trip-making behavior, household size, household income, population, number of licensed drivers, and employment.

Travel Demand Forecasting Models

Travel demand models project regional traffic and forecast link volumes through the four-step process. Base year estimates are typically calibrated against ground counts, and then volume projections are made for future scenarios. VMT estimates are obtained from the product of the forecasted link volumes and the respective centerline mileage of the link.

Output from travel demand forecasting models is also used to estimate heavy-truck and passenger-vehicle VMT. One of the main problems with travel demand forecasting models is that they often lack the data to model heavy trucks as well as they model passenger vehicles. The accuracy of the output volumes also depends on the trip generation and trip distribution components of the model and the representativeness of the network to the actual street system. Local roads, for instance, are usually not modeled in travel demand models. Several studies report different methods to improve heavy-truck VMT estimates using travel demand forecasting methods. Drishnan and Hancock (1998) used statewide freight flow data from the Commodity Flow Survey (CFS) with travel demand forecasting in a GIS to estimate truck flows. Ross et al. (1998) recorded trip diaries for heavy trucks to locate origins, destinations, and routes.

Fuel Sales

This method estimates VMT from fuel sales. Total fuel sales for retail gasoline and diesel are divided by the unit price per gallon of fuel to obtain the total amount of fuel purchased in an area. Estimates of fuel fleet efficiency are used to determine miles traveled per gallon of fuel purchased, and VMT is then calculated using the following equation:

$$VMT = (Ret_{sales} \times MPG)/PPG \quad (2\text{-}1)$$

where

Ret_{sales} = total sales of fuel for study area in dollars
PPG = average unit price per gallon of fuel in dollars
MPG = fleet fuel efficiency in miles per gallon

Errors associated with this method result from the inaccurate estimates of retail fuel sales and prices. Additionally, wide variations exist in the fuel efficiency of individual vehicles. Consequently, estimates of fleet fuel efficiency are gross estimates at best. Additionally, it is difficult to distribute VMT between residents and non-residents (Kumapley and Fricker 1996).

2.1.2 Traffic-count-based methods

The traffic-count-based method uses actual counts of traffic volumes. VMT is calculated by multiplying AADT on a section of road by the length of the section. To annualize this value, it is multiplied by the number of days in a year. In estimating VMT using traffic counts, it is customary to assume that a vehicle counted on a section of road travels the entire length of the section. Under this method, some vehicles traveling only a portion of the section will be counted while others will not, depending on whether they cross the counting location (Roess et al. 1998). This method of estimating VMT is presently the most preferred by state DOTs as it utilizes actual data of vehicle movement on a road segment (Kumapley and Fricker 1996). About 70% of state DOTs, including the Iowa DOT, use a traffic-count-based method (Benekohal and Girianna 2002).

Highway Performance Monitoring System (HPMS) Method

The HPMS is a national level highway information system that includes data on the extent, condition, performance, use, and operating characteristics of the nation's road infrastructure. It was originally developed in 1978 by the Federal Highway Administration (FHWA) to monitor the nation's highway infrastructure and has been continuously modified over the years (most recently in 1998) to reflect changes in highway systems, legislation, and national priorities, as well as to streamline reporting requirements. The HPMS data are the source of a large portion of information published in the annual Highway Statistics Series and other FHWA publications. They also form the basis of the analyses that support the biennial Condition and Performance Reports to Congress. In addition, data from the HPMS are used to produce statewide estimates of total VMT used for the apportionment of Federal-Aid funds under TEA-21.

The HPMS method of estimating VMT involves the use of continuous count stations to develop expansion factors which reflect daily and monthly traffic patterns. Sample sections on other roadways are identified through a systematic stratified random sampling process. After the sections are identified, 24-hour traffic counts are taken. The short-term counts are extrapolated to reflect annual daily volumes using the expansion factors developed with continuous count data. The sample section VMT is estimated as the product of the centerline mileage and AADT of the section. Sample section VMT is used to approximate area wide VMT. The HPMS method usually covers only roadway sections under state jurisdiction. Local and county roads, which usually form a major percentage of the road network in a state, are not considered in the HPMS submittal (FHWA 2001).

2.2 Calculation of Annual Average Daily Traffic

VMT usually is the product of the roadway section length in miles (centerline mileage) and AADT. In order to obtain reliable VMT estimates, accurate estimates of AADT must be developed from traffic monitoring programs. The Federal Highway Administration's (FHWA) Traffic Monitoring Guide (FHWA 2001) provides guidance for improved traffic counting, vehicle classification, and truck weighing. Statistical procedures are provided that allow State Highway Agencies (SHAs) to determine the amount of monitoring required to achieve a desired precision level for their traffic counting needs. The Traffic Monitoring Guide (TMG) recommends two types of counts to be conducted in order to estimate AADT:

- Long-term or permanent continuous counts (year-round)
- Portable short-term counts

Additional Counts are performed as a supplement to the coverage program to address "special needs" and may include the following:

- Pavement design counts performed to provide data for pavement design
- Maintenance, repair, rehabilitation, and reconstruction
- Traffic operations counts performed to provide inputs to traffic control studies (e.g., the creation of new signal timing plans)
- Traffic counts for other special purpose studies (FHWA 2001)

2.2.1 Permanent Continuous Counts

Continuous counts are performed using permanent counters, frequently called Automatic Traffic Recorders (ATRs), which collect traffic data continuously for 24 hours a day, 365 days a year. The primary goal of the continuous count program is to assist agencies in understanding the time-of-day, day-of-week, and seasonal travel patterns and to facilitate the development of seasonal expansion factors required to convert short-term counts to accurate estimates of AADT. Continuous ATR count data is also reported on a monthly basis to the FHWA for the preparation of the Traffic Volume Trends Report.

Since the ATRs monitor traffic every day of the year, an Annual Average Daily Traffic (AADT) is obtained by adding all volumes collected by an ATR for an entire year and dividing by the number of days in a year. Permanent counters record volume variation by day of the week and month of the year. Expansion factors are created by permanent count data to allow adjusting short-term count data to account for daily and monthly variation facility type (Roess 1998). The adjustment factor is then obtained from the ratio of the AADT to the Monthly Average Daily Traffic (MADT) of the same ATR group for each road type. Multiplying the short-term count by the appropriate factor expands the short-term counts.

2.2.2 Short-Term Counts

The installation, operation, and maintenance of permanent counters are expensive. Consequently, short-term coverage counts are conducted on roadways throughout a state to provide the geographic coverage needed to understand the traffic characteristics of the state roadway system.

The TMG recommends a short-term count program comprised of periodic comprehensive coverage of all roads on all systems over a 6-year cycle and counting on HPMS sample and universe sections on a 3-year maximum cycle to meet the national HPMS requirements. Short-term count data used for AADT computation must be adjusted to remove temporal bias from the data. Seasonal adjustment factors derived from the permanent continuous counts are used to adjust the short-term counts to arrive at AADT estimates (FHWA 2000).

2.3 Truck VMT Estimation

About 70% of state DOTs, including the Iowa DOT, use a traffic-count-based method for estimating truck VMT (Benekohal & Girianna 2003). Currently, two different traffic-count-based methods are used to calculate truck VMT. In the first method, truck VMT is estimated on a highway segment basis by multiplying truck AADT by the length (centerline mileage) of a roadway section. The second method is the HPMS method described above. It estimates truck VMT by multiplying total VMT by an average truck percentage.

The best possible VMT estimates would be those obtained using the traffic-count-based method if all road sections of interest are monitored continuously throughout the year to produce AADT (Kumapley and Fricker 1996). Resource constraints, however, make it impractical for the collection of traffic count data on all sections of interest. Hence, data are collected continuously at a limited number of count locations, while other locations are counted only at infrequent intervals, such as once every 3 years, for relatively short durations—usually 24 or 48 hours (Weinblatt 1996). To account for the temporal variations in short-duration traffic counts, data from sites that are counted continuously are used to develop expansion factors for factoring short-duration counts to estimates of annual average daily traffic (AADT). Although truck volumes, like passenger car volumes, vary over time and space, the pattern of temporal variability in truck volumes differs significantly from that in passenger vehicles (Roess et al. 1998). Trucks experience more variability between weekdays and weekends than passenger vehicles. As such, adjustment factors derived from aggregate count data (total volume) may fail to adequately explain temporal variations in truck traffic, culminating in biased estimates of annual average daily truck traffic (AADTT). In order to obtain accurate estimates of annual average truck volumes and, consequently, truck VMT, truck adjustment factors must be developed specifically to convert short-duration truck volume counts into estimates of AADTT.

3. VMT ESTIMATION METHODOLOGIES USED BY STATE DOTS

The DOTs for ten states were contacted to determine the methodology used in their Traffic Monitoring Program to estimate truck AADT and VMT. When possible, information was obtained from DOTs websites. DOTs were contacted for additional information and clarification when necessary. Responses received from the DOTs are provided in Appendix B.

All the state DOTs contacted use the traffic-count-based method to estimate VMT. The traffic-monitoring programs adopted by the state DOTs contacted were similar and all conform to the recommended procedures outlined in the FHWA's Traffic Monitoring Guide (FHWA 2001). A summary of the methodologies used by the different DOTs to estimate VMT, as well as methods to estimate truck VMT, are provided in the following sections. A summary of the truck VMT estimation methods by the states contacted is presented in Table 3.1 below. In general, two methods are used by these DOTs to estimate truck VMT. In the first method (method 1), truck VMT is estimated on a highway segment basis by multiplying the segment truck AADT by the length of the segment. The second method (method 2), also referred to as the HPMS method, involves multiplying total aggregate traffic VMT (by functional class) by average truck percentages (by truck types).

Of the ten state DOTs contacted, six (California, Illinois, Iowa, Minnesota, Nebraska, and Florida) use method 1 for the estimation of truck VMT. Kansas, Missouri, South Dakota, and Wisconsin DOTs use method 2. A more in-depth explanation of the different methods used by the various states to estimate truck VMT is provided in the following sections.

Table 3.1. Methodologies to estimate truck VMT by state surveyed

State	Methodology	Truck Adjustment Factor
California	Method 1	Yes
Illinois	Method 1	Yes
Iowa	Method 1	No
Kansas	Method 2	No
Minnesota	Method 1	No
Missouri	Method 2	No
Nebraska	Method 1	Yes
South Dakota	Method 2	No
Wisconsin	Method 2	No
Florida	Method 1	No
**Method 1 (highway segment basis): truck AADT by length of a roadway section. **Method 2(HPMS): total VMT by average truck percentages		

3.1 Wisconsin

3.1.1 Data Collection

On the state trunk network, sites are selected to be representative of traffic on a segment bounded by roadways functionally classified as collector or above. Permanent sites were semi-randomly selected to provide a statistically valid sample for each factor group. A total of 27,000 counting sites (permanent and short duration) are located throughout the state of Wisconsin.

Peek 241 and ADR counters are used to collect volume, class, and speed, while Peek ADR and PAT DAW200 are used for Weigh-in-Motion (WIM). The equipment is tested annually to verify their operational integrity. Equipment is bench tested and observed in the field to determine if it is working when installed/inspected.

Wisconsin Department of Transportation (WisDOT) collects both volume counts with loops and axle counts. Axle counts are adjusted using an axle adjustment factor. At the short-term count locations, counting is conducted at 15- to 60-minute intervals for 48 hours every three years. The interval is determined by the population density in the area of the count.

3.1.2 Truck VMT Estimation

WisDOT at this time does not develop separate truck adjustment factors but is moving in that direction. VMT estimates for all vehicles are made. The average percentage of vehicles for each vehicle type by highway functional classification is calculated. VMT for a particular category of heavy trucks for a particular functional class is determined by multiplying VMT for that specific functional class by the percentage of heavy trucks. These are then summed to a statewide total VMT for heavy trucks. Consequently, heavy truck VMT is not disaggregated below the statewide highway functional level (Stein 2003).

3.2 Nebraska

3.2.1 Data Collection

Most of the permanent count sites used by the Nebraska Department of Roads (NDOR) were established years ago. While the exact reasoning behind the selection was not recorded, it is believed that they were selected to give information that was representative of long segments of the natural traffic corridors in the state. In addition, some stations were established to give information on a greater saturation of the most important corridor (I80), while others were established to give information on typical urban routes or county roads. NDOR collects and processes continuous traffic data at 65 locations. Short-duration counts are located to give information that is representative of much shorter sections of road, short enough to be used to update NDOR's computerized traffic log with site-specific information.

"Diamond" brand traffic counters are used for both permanent and short-duration counts. Vehicle classification information is collected at most of the permanent-count stations. At the short-duration stations, volume only is generally collected; although, occasionally, classification information is collected. Nearly all short-duration counts are performed using a pneumatic hose as a detection device. The notable exception to this is the urban interstate and other high-volume urban roads where radar detectors are used.
NDOR has not made an attempt to quantify the level of accuracy it achieves in its counting program. When posting counts, however, a comparison of the final results with historical results is made to give an indication of the reliability of the results of the count.

When factoring short-duration portable counts, a monthly adjustment factor, a day-of-week adjustment factor, and an axle correction factor (if a hose type counter) are used. The adjustment for short-term manual classification counts is based upon the road group category, month, day-of-week, hours-of-count, and the individual vehicle type.

3.2.2 Truck VMT Estimation

Truck VMT is calculated on a biennial basis by NDOR during the years when traffic counts are performed on its state highway system. Expansion factors are developed separately for trucks from the data collected at ATR locations where detailed vehicle classification information is collected. On the highway system, truck VMT is calculated by a simple accrual of what is on the Nebraska DOT's traffic log files. Off the highway system, sample manual counting data is used to estimate truck VMT. NDOR has documentation of its Traffic Monitoring Program that specifies much more detailed information, instructions, and techniques, available for in-house use only (Ernstmeyer 2003).

3.3 Missouri

The Missouri DOT currently does not develop separate expansion factors for trucks. Instead, it determines the average percentage of trucks for each of the ten functional classes, using approximately 60 continuous Automatic Vehicle Classifiers (AVC) statewide. Truck VMT is then estimated by applying this percentage to the total VMT for each functional class of roadway. However, the Missouri DOT is in the process of refining their process and has approximately 550 AVCs to update all Traffic Monitoring Sites (TMS) segments with a similar process as is currently used to update uncounted AADT segments. This process will provide a method for calculating actual Truck VMTs (Grither 2003).

3.4 Illinois

3.4.1 Data Collection

Illinois DOT's (IDOT) permanent count sites were selected in the early 80's using functional class and average daily traffic (ADT) volumes to gain a good representation of roads within Illinois. Additional sites were added in the late 90's using the same criteria along with a geographical distribution. The short-term counts that are done each year are at locations between significant traffic generators. Counts are done in cycles with the marked routes every two years. The rest of the county counts on a five-year cycle. IDOT maintains 88 permanent sites throughout the state of Illinois. 20,000 short-term counts are taken each year. During a five-year period, approximately 85,000 different locations are counted.

The permanent sites use single loops or dual loops with a piezo classifier. A variety of recorders (Peek 241, Peek ADR3000, and ITC TRS recorders) are used. For short-term counts on marked routes, the NuMetric Hi-Star magnetic lane counter is used. This counter is used because it gives volume, vehicle length, and speed (vehicles are counted, not axles). For lower class roads in the counties, road tubes with Mitron counters (axle counts are collected) are used.

When searching for new equipment and new traffic technologies, in-house testing is performed. IDOT will look at manual counts vs. the new equipment, compare different types of equipment, and conduct studies to determine consistency and reliability of the equipment. To evaluate the accuracy of counting devices at the permanent locations, IDOT has someone on staff who downloads the data daily and reviews the data for consistency, looking for loops not reporting or not providing reasonable data. Using this long-term experience with the permanent locations gives a good indication of the reliability of the permanent equipment.

Most short-term counts are 24-hour counts (counted on a Monday, Tuesday, Wednesday, or Thursday). HPMS counts required for FHWA are 48-hour counts.

3.4.2 Truck VMT Estimation

The data (over a four-year period) from the permanent locations is used to derive monthly factors. These monthly factors convert 24-hour short-term counts into annual average daily traffic (AADT). Along with the factoring, the AADT numbers are rounded to the nearest 100, 50, or 25, depending on the volume range. IDOT uses separate adjustment factors for trucks in the estimation of annual average daily truck traffic. The truck factors currently used were developed from an extensive manual count program maintained by IDOT in the past. This extensive manual count program was, however, eliminated many years ago. IDOT is in the process of updating its truck factors based on the permanent locations. Truck expansion factors from the manual count program are used to convert 24-hour short-term truck counts into the truck annual average daily traffic. After factoring, truck AADT is rounded to the nearest 100, 50, 25, or 10, depending on the volume range. The truck ADT for a segment of road is multiplied by the length of that

segment to calculate the truck VMT for the individual segment. The total truck VMT is obtained by adding all segments together. For roads where truck counts are not required (lower functional class roads), default values for the trucks are used in the truck VMT calculation.

IDOT has made significant changes in its Traffic Monitoring program during the last few years. It has changed equipment to the NuMetric Hi-Stars for its Marked Routes. Also, the cycles of counts have been revised to better distribute the work between the years. IDOT has an Illinois Traffic Monitoring Guide (ITMG); however, it represents the old way in which IDOT executed the program. It is envisaged that a completely revised version of the ITMG would be available soon (Robinson 2003).

3.5 Minnesota

3.5.1 Data Collection

For AADT segments on Minnesota trunk highways, every traffic segment is counted every two years. A traffic segment is defined by a section of road where traffic is expected to vary longitudinally (up and down the segment) within specified limits. The limits are defined by a curvilinear relationship between permitted percentage difference and the AADT of the segment. Higher AADT segments have a smaller percentage deviation allowance than lower AADT segments. When traffic changes along a segment, special counts can be made to confirm the change of traffic segment definition before a formal change to the segment is made. Changes to segments include simple lengthening and shortening, as well as adding new segments and deleting segments based upon actual traffic measurements and the sliding scale described above.

The sliding scale represents a minimum coverage strategy for Minnesota DOT (MnDOT) traffic monitoring program. Additional locations are sampled routinely, even if they are within the allowable limits, to increase sensitivity to traffic volume differences between segments in some areas and along certain roadways. The same segmenting procedure is used for county and municipal highways when determining AADT. Local highways are counted on a two or four-year cycle, depending upon how many changes the local jurisdictions believe will happen in the near future. Quickly growing jurisdictions typically desire a two-year count cycle, while relatively slow growing jurisdictions are content with a four-year cycle.

Short-duration vehicle classification count studies are usually conducted on segments between the intersection of one trunk highway and the intersection of another trunk highway. Some trunk highway to trunk highway segments have more than one vehicle classification count site since the shorter segments were found to be serving different commercial traffic.

Permanent sites were initially selected decades ago to represent traffic in many different areas of the state and on different highways where a variety of traffic patterns and volumes exist. The initial selection process had more to do with differences in traffic patterns and volumes than with which functional class systems the highways belong to.

MnDOT reduced the number of ATRs from 144 to 78 in an effort to remove relatively redundant sites. The active ATRs were retained because of their importance to the department in the following areas:

- Location of the monitors provides the traffic pattern data that, when clustered statistically, provide the basis for determining adjustment factors (day of the week and month of the year). These factors are used to expand short counts (48-hour ADT counts) to annual average daily traffic.
- Values from a number of stations closely follow the measured statewide VMT growth rate during the past ten years. The data from these ATRs are used to constrain the annual statewide VMT every year as counted and uncounted road system AADTs are determined through counts and through annual growth factoring.
- Traffic volumes and traffic patterns (Design Hour Volume among other things) on interstate highways in the Minneapolis/Saint Paul metropolitan area are necessary for a number of applications.
- Traffic volumes and traffic patterns (Design Hour Volume among other things) on interstate highways in the rest of the state are necessary.
- Traffic volumes and traffic patterns for state identified "interregional corridor" highways were desired.
- Speed monitoring capability is present.
- Continuous vehicle classification using traffic volumes and patterns is becoming a stronger emphasis in MnDOT’s traffic monitoring program.

Approximately 32,000 locations are counted for AADT. About 4700 of those 32,000 locations are on the trunk highway system, and many of these counts are taken directionally. MnDOT has 78 ATRs (for continuous volume counting), 14 of which are classification capable. Data from the department's traffic management center loop detectors are used in place of tube counts or intermittently sampled loop sites for the freeway system in the Minneapolis/Saint Paul area. There are approximately 1000 routinely sampled short-duration classification count locations in the state that are sampled on a two- or six-year cycle. Additional classification counts are conducted to satisfy special requests and additional research needs.

ATRs are equipped with either piezo-loop-piezo detectors, dual-loop detectors, or single-loop detectors with PEEK ADR controllers. Short-duration ADT tube counts are taken with equipment from TimeMark and Golden River. Short-duration vehicle classification tube counts are taken with TimeMark equipment by people assisted by a personal computer touch-screen based application. For short-count equipment, the tubes are checked for holes and the counters’ switches are checked for accuracy each year. Inevitably, some data are suspect, and recounts are usually taken at the same location to verify an unexpected value or determine whether there was a faulty count taken the first time. Accuracies within 5% for classification and 2% for axle hits and for vehicle detection at the ATRs are normally expected.

At the permanent sites data are checked within one month following the date of collection to determine if there are failing electronics or detectors. It is believed that such failures can be detected when the daily and hourly directional data are compared to historically typical data at the same sites. If a consistent bias seems to be "creeping" into the data, a field test is requested, and the results allow salvaging the data for the time period in question if it is warranted. This type of data screening and editing only happens for ADT data and not for vehicle classification data. A system is currently being developed to screen the continuous classification data.

For short-duration ADT counts, raw data are screened using a system that compares the factored raw counts to previously determined past AADT and to previously adjusted raw counts from the same count cycle and from the past count cycle. Direction distribution is compared where possible and a report is run for machine numbers where the machines have been involved in a high proportion of "suspect data" instances. Those machines are identified and pulled from the active stock during the counting program to be bench tested. For locations with counts that are deemed "suspect" according to a permitted percentage change function, recounts are requested during the same year or count cycle. Short-duration classification counts are compared to previous counts at the same location. Axle correction factors are determined at each of the routine and special count classification sites (approximately 1400 statewide). Segments adjoining and beyond the classification sites also have axle correction factors. The factors, however, are determined using an algorithm based on "change in AADT" vs. "change in vehicle mix" relationship relative to the vehicle classification sample site and the roadway segments associated with the vehicle classification site.

Usually sample 48-hour counts are taken at all of the short count sites where counting equipment is used. Past federally sponsored "best practices" research indicated that 48 hours is better than 24 hours but only marginally worse than 72 or more hours. Also, more tube anchorage failures have been experienced in counts longer than 48 hours. For each manually counted vehicle classification site, two periods of 8 hours at a time are monitored between 8 AM and 10 PM. MnDOT does not count over the weekend and tries to conduct counts between noon on Monday and noon on Friday during weeks that do not include holidays or local festivals or events. In towns and cities, counting is done during the school year.

3.5.2 Truck VMT Estimation

MnDOT currently does not develop separate adjustment factors for trucks but is now investigating how it might in the near future. Since MnDOT has a census-based estimating system for the trunk highway system, Heavy Commercial Annual Daily Traffic (HCADT) by segment is used to estimate Truck VMT on a highway segment basis. The segment Truck VMT is then summed to produce a statewide total for trunk highways. For county, municipal (and other types of roadways) default values are used to estimate truck VMT to complete truck VMT statewide calculations (Flinner 2003).

3.6 California

3.6.1 Data Collection

The following is taken into account when selecting sites for permanent and short-term counts:

- Beginning of Route
- End of Route
- Break in Route
- Significant change in traffic (approximately 10% change)

A breakdown of the count sites (permanent and short-term) located throughout the state of California is given as follows:

- 650 permanent count sites where data is collected 365 days a year
- 1800 quarterly sites which are counted for a one-week period 4 times a year every 3 years
- Over 5000 profile sites which are sites on conventional highways counted between one and seven days every 3rd year
- Over 14,000 Freeway on and off ramps counted between one and seven days every 3rd year

The California Department of Transportation (CalTrans) uses the same equipment for both permanent and short-term counts. The number of lanes and type of detector used will determine how many detectors the counter will have. The equipment must meet the following accuracy standards:

- ***Accuracy of Traffic Volume counts*:** The unit must have an accuracy of plus or minus 5% with a 95% confidence level when using pneumatic tubes and plus or minus 3% when using inductive loops.
- ***Accuracy of Vehicle Classification*:** Vehicle classifiers must classify to accuracy standards as follows:
  - ***Permanent Classifiers:*** The accuracy of permanent classifiers using inductive loops and piezoelectric axle sensors must be such that, if good lane discipline is maintained, the recorded axle spacing must consistently be within plus or minus four inches of the actual measured spacing.
  - ***Portable Classifiers:*** The accuracy of portable classifiers using dual pneumatic tubes must be such that, if good lane discipline is maintained, the recorded axle spacing must consistently be within plus or minus six inches of the actual measured spacing. Of the 650 continuous and 1800 quarterly count sites, total volume is collected at all of them. At 200 of them, vehicle class is collected. Only total volume is collected at all other count sites. If resources are available, truck counts are collected at a limited number of sites.

3.6.2 Truck VMT Estimation

From continuous and quarterly count sites, daily and seasonal factors are developed to extrapolate one-day counts. CalTrans develops separate adjustment factors for trucks from continuous truck count sites. If resources are available, short-term truck counts are collected at a limited number of sites. The short-term counts are converted to Annual Average Daily Truck Traffic (AADTT) using the truck factors obtained from the continuous truck sites.

3.7 Kansas

3.7.1 Data Collection

Permanent count sites were selected for coverage of the major highways. Portable count sites were selected for coverage of HPMS sections, for spatial coverage between permanent sites, and for special needs studies. Portable classification sites were selected for stratified coverage as specified in the TMG and for special needs studies. Permanent classification/weight sites were chosen for proximity to long-term pavement performance (LTPP) test sections. The permanent count sites maintained by the Kansas DOT (KSDOT) are made up of 103 volume-count sites, 3 vehicle classification sites, and 12 weigh sites. The short-term count sites are made up of over 30,000 volume-count sites, over 1,000 vehicle classification sites, and 73 portable weigh sites.

3.7.2 Truck VMT Estimation

The Kansas DOT at this time does not develop adjustment factors separately for trucks. Average truck percentages are determined from continuous vehicle classification sites for each functional class of roadway. Truck VMT is then estimated by applying this truck percentage to the total VMT for each functional class (Spicer 2003).

3.8 South Dakota

3.8.1 Data Collection

There are 51 ATR locations around the state of South Dakota. The breakdown by functional classification is given as follows:

Classification	Urban	Rural
Interstate	3	9
Principal Arterial	4	17
Minor Arterial	3	6
Collector	4	5

ATRs collect traffic data continuously 24 hours a day, 365 days a year. The data collected are used for the development of seasonal factors to expand the short-term counts to AADT. ATRs also provide peak hour, 30th highest hour, or design hour and are used to track volume trends on the state highway system. The PEEK Inc. ADR traffic counters are used for the collection of data at all the 51 ATR stations.

Short-term traffic volume counts provide the majority of the geographic diversity needed to provide traffic volume information on the state roadway system. There are approximately 6,660 short-term count locations throughout the state. These are located on all functional classifications of highways—from the interstate system to the local roads system. Short-term interstate counts are taken 2 times a year for 48 hours each time. All other short-term counts are taken once a year for 24hours. A sampling plan is developed each year for short-term counting and is based on the following monitoring cycle:

- All trunk locations—every other year
- Non-state trunk locations with ADT<75—every eight years
- Non-state trunk locations with ADT>75—every four years
- Urbanized areas—every four years
- Small cities and towns—every six years
- HPMS sample segments (non-interstate)—every year
- HPMS sample segments (interstate)—every three years
- Special site-specific counts as requested
- Sites are chosen each year for specific data needs for future construction projects and for requirements of HPMS

3.8.2 Truck VMT Estimation

Short-term volume count results are posted in the station description file spreadsheet, where the appropriate seasonal and axle correction factors are applied to calculate the AADT for that location. Comparison of the AADT with the historical count record at that location is made, and any count that does not compare reasonably to the historical pattern is flagged and marked to be reset and counted again during the current count season. Counts that pass this check are used in the year-end reporting process.

At the end of the year, all counts in the station description file are entered into the roadway environment subsystem (RES) spreadsheet at their proper locations along a highway based on mileage reference marker (MRM). The counts are averaged with the previous year's counts and the result is reviewed to ensure realistic flow in comparison with surrounding sites. All counts passing this check are then entered into the RES traffic file located on the mainframe computer. The program calculates growth factors and applies them to locations where counts were not taken for the current year. Current year traffic is calculated from the previous year's traffic on these sections using the calculated growth factors. Twenty-year projected traffic counts are also calculated for each section of highway. A final count edit check program is run comparing the new count information with the previous years. A percentage of increase or decrease from the previous years is calculated. Any percentage outside the range set for the volume group the count falls in is flagged and manually analyzed. The South Dakota DOT uses only the HPMS method for Truck VMT estimation. Expansion factors are not developed separately for trucks.

3.9 Florida

3.9.1 Data Collection

The Florida Department of Transportation (FDOT) maintains more than 300 Telemetered Traffic Monitoring Sites (TTMSs) across the state of Florida. All these sites count traffic volumes, 49 of them record speed as well, 194 record vehicle classification, as well as volume and speed, and 37 measure vehicle weights in motion. Data are collected continuously at the TTMSs and are downloaded over phone lines each night. The seasonal variations in data at the TTMSs are used to apply seasonal corrections to the spot counts at the Portable Traffic Monitoring Sites (PTMSs) to make them representative of year-round averages.

There are over 6,100 PTMSs across the state of Florida. Data are collected over a 24- or 48-hour period each year. Vehicle classification data are collected at nearly 2,000 sites, and weigh-in-motion data are collected by portable equipment at 24 sites for FDOT's Strategic Highway Research Program.

3.9.2 Truck VMT Estimation

Truck VMT is calculated by multiplying segment AADT by percentage of trucks and segment length and then summing all the segments on the highway system. Counts are taken each year on all of the state highways for which FDOT is responsible to obtain the AADT of each segment of its highway network. Florida state highway system consists of about 1,100 sections, each of which can be broken into smaller segments. Traffic data is collected on about 7,000 of those smaller segments. Of those segments, all are counted, and about 2,500 are classified. FDOT's procedures call for a minimum of one class survey on each of the 1,100 sections of road. For the segments not classified, percentage of trucks is assigned based upon the axle factor categories assigned to all stations. The great majority of FDOT's count stations have highway-specific axle factor categories assigned to them. For the segments of road without either actual class stations or axle factor categories, percentage of trucks is assigned by either region or statewide functional class defaults.

4. IOWA DOT METHODOLOGY

The Iowa Department of Transportation uses the traffic-count-based method to estimate VMT. To achieve the desired precision required for national reporting requirements for AADT estimates, the Iowa DOT bases their methodology on the procedures outlined in the Federal Highway Administration's (FHWA) Traffic Monitoring Guide (TMG) for its Traffic Monitoring Program.

In compliance with TMG procedures, Iowa DOT's Traffic Monitoring Program consists of a short-term count program and a permanent continuous count program. The short-term counts are usually conducted for a 24- or 48-hour period to ensure that adequate geographic coverage exists for all roads under the jurisdiction of Iowa DOT. The permanent continuous counts conducted continuously throughout the year facilitate the computation of seasonal adjustment factors utilized in the conversion of the short-term counts to AADT.

4.1 Permanent Continuous Count Program

A total of 139 permanent continuous count stations are located throughout the state of Iowa. Data collected at the permanent count sites include volume, classification (3-class and 13-class), speed, and axle weight. A breakdown of the type of data collected at these stations is presented in Table 4.1. A number of sites have been in place since 1950, when the Iowa DOT began its Traffic Monitoring Program. Additional new sites are selected on the basis of regionality, population, and functional class.

Table 4.1. Data collected at permanent stations

Data Type	Number of the Count Stations Capable of the Indicated Function
Volume	139
Speed	93
3-Class	67
13-Class	38
Automatic Traffic Recorder	128
Weigh in Motion	22
LTPP/SHRP	15

*ATR-Automatic Traffic Recorder, WIM-Weigh-in-Motion, LTPP-Long Term Pavement Performance, SHRP-Strategic Highway Research Program.

The Iowa DOT uses PEEK ADR 2000 and the Trafficomp (TC) 3 control units, which are attached to piezo-electric sensors (Brass Linguini (BL) Axle Sensors) or induction loops, which are permanently embedded in the road surface for continuous data collection. The use of piezo-electric sensors enables the collection of the same information as that obtained using a portable counter unit but with a slightly higher level of accuracy and precision. The use of induction loops facilitates vehicle classification by overall length instead of axle spacing but results in less precision. On the other hand, the accuracy of volume data obtained using induction loops is increased since the true presence of vehicles is detected.

4.2 Short-Term Count Program

For the purpose of short-duration counts, the state was divided into four quarters, as shown in Figure 4.1. One quarter of the state is counted each year; thus, the entire state is covered in a four-year cycle. During the four-year cycle, the complete road network in some counties within a quadrant is covered, whereas only major routes are covered in the remaining counties. Counties scheduled for complete counting in the current schedule are shown hatched in Figure 4.1. The reverse is true in the alternate cycle. This ensures that the entire road network within a quadrant is covered in an eight-year cycle and enables Iowa DOT to concentrate its effort in providing more detailed information while utilizing its resources efficiently.

Mechanical and manual counts are conducted at the short-term count sites to collect volume and classification data. Approximately 11,000 to 12,000 mechanical counts and 800 to 1,000 manual counts are performed in each counting year. The ADR or TraffiComp3 portable automatic counters connected to pneumatic road tubes are used for mechanical counts and the Titan count board (a portable microprocessor) is used for manual counts. Mechanical counts are usually conducted for a 24- or 48-hour period, whereas manual counts are usually done in two time periods of four hours each or three consecutive eight-hour blocks. Counts are conducted in at least 48-hour periods on interstates and primary roads and 24-hour periods on non-primary roads.

Volume data are obtained either by manual counts or by factoring axle strikes from mechanical counts using axle correction factors (obtained from continuous counts and based on the type of road system).

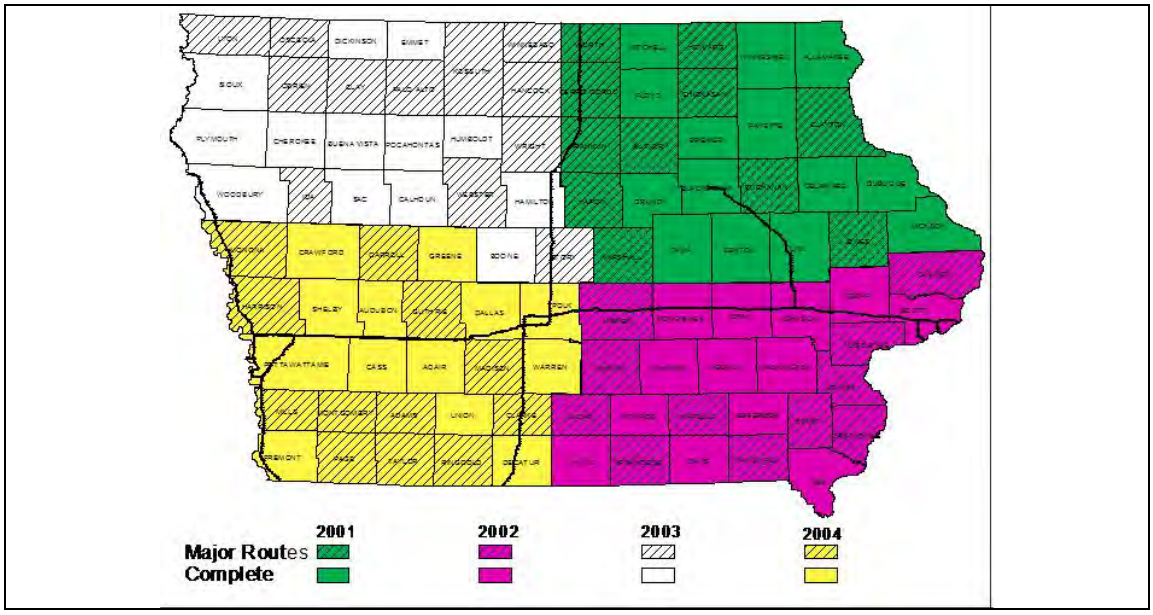


Figure 4.1. Iowa Traffic Count Program (2001-2004). Source: IDOT Traffic Monitoring Manual

4.3 Factoring Process

The conversion of raw data from short-term counts to estimates of AADT requires the application of adjustment factors to account for temporal biases, as well as the type of traffic counting equipment used. The specific set of adjustment factors required is therefore a function of the equipment type and the duration of the count (FHWA 2001). For example, a 24-hour short-term count at a particular location in which axle strikes are collected will require the application of an axle-correction factor, day-of-week, and seasonal factors. In this case, the equation for the estimation of AADT will be the following:

$$AADT = VOL_{24} \times M \times D \times A \quad (4\text{-}1)$$

where

AADT=the annual average daily traffic
VOL=the 24-hour axle volume
M=the applicable seasonal (monthly) factor
D=the applicable day-of-week factor
A=the applicable axle-correction factor

4.4 Axle-Correction Factors

Iowa DOT usually collects axle strikes on rural secondary roads and city streets using short-duration portable recorders with one pneumatic hose. Since most vehicles have two axles, axle strikes are divided by two to provide a total volume, assuming all vehicles are cars. The portable counters do this automatically. The volume obtained after dividing the total axle strikes by two is then multiplied by axle correction factors computed for the various road systems using thirteen-class manual count information.

4.5 Seasonal and Day-of-Week Factors

Two different methods are used to create adjustment factors, as described in the following paragraphs.

Specific road approach. With this approach, road specific adjustment factors are developed using data collected from continuous counts. Short-term classification count for a specific road is adjusted using factors from the nearest continuous classification counter on that road. This method, in addition to simplifying the computation and application of adjustment factors, also has an advantage of reducing errors associated with using average adjustment factors to estimate AADT. It is, however, more costly since state DOTs have to maintain a large number of continuous counters (Benekohal and Girianna 2002).

Group factor approach. With this approach, roadway sections with similar travel patterns and roadway functional classification are grouped together. Continuous classification count locations are selected from each grouping of roadway sections and

adjustment factors are developed for data collection sites within each group. Adjustment factors for each group are averaged and used to adjust short-term data that are collected at locations within the group.

Iowa DOT utilizes the group factor approach for the development of combined seasonal and day-of-week adjustment factors. Six different factor groups clustered according to road system type and regionality are developed. Roadway types include rural interstate, rural primary, rural secondary, municipal interstate, municipal primary, and city streets. Factor analysis was used to determine if breakdown by road system type and regionality was appropriate. Factors are generated based on the volume data obtained from the permanent continuous count sites. AADT at the permanent count sites is a simple average of volume data for all days. Since traffic is monitored continuously throughout the year at these sites, adding all volumes collected by an ATR for an entire year and dividing by the number of days in a year produces an AADT:

$$AADT = \frac{\sum_{i=1}^{365} VOL_{24}}{365} \quad (4\text{-}2)$$

The ratio of the AADT to the average total traffic of each day of week for a specific month of the same individual ATR produces factors for each day of the week, by month, for each road system type. An average of the factors for all ATRs within a factor group is determined. In the computation of the factors, data for the last three years at each ATR location are utilized. The days when holiday traffic may skew the results are excluded.

Raw data from the 24- or 48-hour mechanical and manual short-duration counts are multiplied by the adjustment factors based on the day-of-week, month, and road type to obtain the estimated AADT.

4.6 Missing Data

Some ATRs may suffer periods of down time due to problems with the equipment, communication, and power failures. This may result in hours or days of missing data that consequently introduces biases in the factor computation, particularly when blocks of data are lost (FHWA 2001). To account for missing data, the Iowa DOT employs historical methods. This involves analyzing data from previous years for the same period in which data are missing in the current year and making projections to fill in the missing data. For instance, if data collected at an ATR station on a Monday in October 2002 are missing data from 1 pm to 3 pm, data for the same period in previous years, such as 1999, 2000, and 2001, are used to extrapolate the missing hours. In a case where an ATR station is missing data over a long period of time, the entire data from that station are excluded from the factor computation. This is sometimes the case when there is an ongoing construction activity along the section of road on which the ATR station is located.

4.7 Estimation of Heavy-Truck AADT

The Iowa DOT specifically conducts short-term truck counts from which truck AADT is obtained. On the primary roads system, truck volumes are obtained primarily from manual turning movement counts and a few portable automatic traffic classifiers. For the secondary road system, truck volumes are obtained from portable automatic traffic classifiers installed at eight locations per county—four on gravel roads and four on paved roads. The Iowa DOT is, however, in the process of revising its traffic count program to ensure an extensive coverage of the secondary road system by installing more traffic counters capable of collecting both volume and vehicle classification data. In the case of city streets where traffic volumes are usually high with relatively small gaps between vehicles, the use of ATRs has been found to produce inaccurate vehicle classification results. Truck volumes on city streets are therefore obtained from eight-hour manual turning movement counts only. These manual counts yield total volume for all vehicles and classification for three vehicle classes: passenger vehicles, single-unit trucks and combination trucks. To expand truck volumes obtained to truck annual average daily traffic, seasonal day-of-week adjustment factors for trucks are developed based on the permanent continuous count locations.

4.8 VMT Estimation

VMT is generally obtained by multiplying the roadway segment AADT (obtained as described above) by the length of that segment. In particular, truck VMT is estimated on roadway segment basis by multiplying the roadway segment truck AADT by the length of that segment. The total truck VMT by road system type is obtained by summing the truck VMT for individual segments belonging to that road system. Multiplying by the number of days in a year annualizes this value. Typically, VMT for municipal roads are adjusted based on the percentage increase or decrease in AADT obtained from the ATR stations (Meraz and Bunting 2003).

5. METHODOLOGY

The purpose of this research was to evaluate and compare several different methods to calculate heavy-truck AADT and, subsequently, VMT. Traffic data from continuous count stations provided by the Iowa DOT were used to estimate AADT for two different truck groups (single-unit and multi-unit) using three different methods. The first method developed monthly and daily expansion factors for each truck group. Truck AADT was calculated by applying truck expansion factors to short-term counts. The second and third methods created general expansion factors for all vehicles. Truck AADT was calculated by multiplying short-term counts by generic expansion factors and truck percentages. Truck percentages for the second method were based on the annual percentage of trucks for each group from continuous count stations. The third method used daily truck percentages from the short-term counts.

Accuracy of the three methods was compared using n-fold cross-validation. In n-fold cross-validation, data are split into *n* partitions and data from the *nth* partition are used to validate the remaining data. Accordingly, data from continuous count stations were divided into four groups, and each group was reserved for one partition as the validation dataset. Short-term counts were extracted from the validation dataset, and then AADT was estimated using each of the three methods. Actual AADT by truck group for each count station was compared to the estimated AADT by truck group for each method. A description of the data and methodology is provided in the following sections.

5.1 ATR Data

Automatic Traffic Recorder (ATR) data for rural primary roadways and rural interstates were obtained from the Office of Transportation Data of the Iowa DOT for the 2001 counting year (January 2001 to December 2001). The study started in 2003, and the 2002 ATR dataset was preferred. However, the DOT indicated that numerous errors were present in the 2002 data and suggested use of the 2001 data instead. Additionally, they felt that the rural interstate and primary road data were the most reliable. Consequently, analysis was made for these two road types.

The rural primary network is made up of all federal and state highways, excluding interstates, outside the limits of any incorporated city or town. Rural interstate network encompasses all interstates outside the limits of any incorporated city or town. Traffic data are collected year round at all ATR sites. Only ATR sites that collect vehicle classification data were considered for the study. At some of the sites, data were collected for 3 classes: passenger vehicle, single-unit (SU) truck, and multi-unit (MU) truck. At other sites, data were collected for all 13 classes of the FHWA vehicle classification scheme.

Some of these sites had a considerable amount of missing data as result of equipment malfunction, communication, and power failures. Data from such sites was discarded. A total of 36 ATR sites remained for the rural primary analysis after eliminating ATR sites which were missing substantial amounts of data. The locations of the 36 ATR sites on the

rural primary network are shown in Figure 5.1. A total of 14 rural interstate ATR stations remained for the rural interstate analysis.

5.2 Vehicle Classification Scheme

Ideally, each of the FWHA truck categories would be evaluated separately, and expansion factors would be created for each class. However, many of the FHWA truck classes contain low traffic volumes. Expansion factors based on low volumes can be unreliable since, with low traffic volumes, small changes result in high percentage of changes. In order to develop reliable seasonal and day-of-week truck adjustment factors, an aggregation of the 13 classes of the FHWA classification scheme into three or four vehicle categories is recommended by the traffic monitoring guide (FHWA 2001). Additionally, a number of ATR stations only recorded 3 classes of vehicles. Consequently data were aggregated into 3 vehicle classes. Stations that reported 13 classes were aggregated into the 3 vehicle classes reported by the remaining stations. The 3 vehicle categories consist of passenger vehicle, single-unit truck, and multi-unit truck. Aggregation of the 13 FHWA vehicle classes is shown Table 5.1.

Table 5.1. FHWA vehicle classes in each vehicle category

Vehicle Category	FHWA Class
Passenger Vehicle (PV)	Classes 1 to 3
Single Unit Truck (SU)	Classes 4 to 7
Multi-Unit Truck (MU)	Classes 8 to 13

Truck VMT is estimated by multiplying AADT by section length once AADT has been estimated. Consequently, AADT, not VMT, was the variable used to evaluate the different methods.

5.3 Creation of Expansion Factors

The Iowa DOT uses the group factor approach to develop expansion factors. The factor groups are made up of all the ATR stations in that functional class, as described in Section 4.5. The group factor approach was used to estimate expansion factors for this research as well. AADT was first determined for each station, and then expansion factors were created for each station.

5.3.1 AADT

ATR data were available in the form of a single 24-hour count for each day for each station. A sample is provided in Appendix C. Each file contains counts by hour of the day, and data are presented by vehicle class. Some stations report 3 vehicle classes, and other stations report all 13. Data were aggregated into 3 vehicle classes, as discussed in Section 5.2. All daily data had to be summarized for each station in order to calculate AADT and expansion factors, requiring a significant amount of effort.

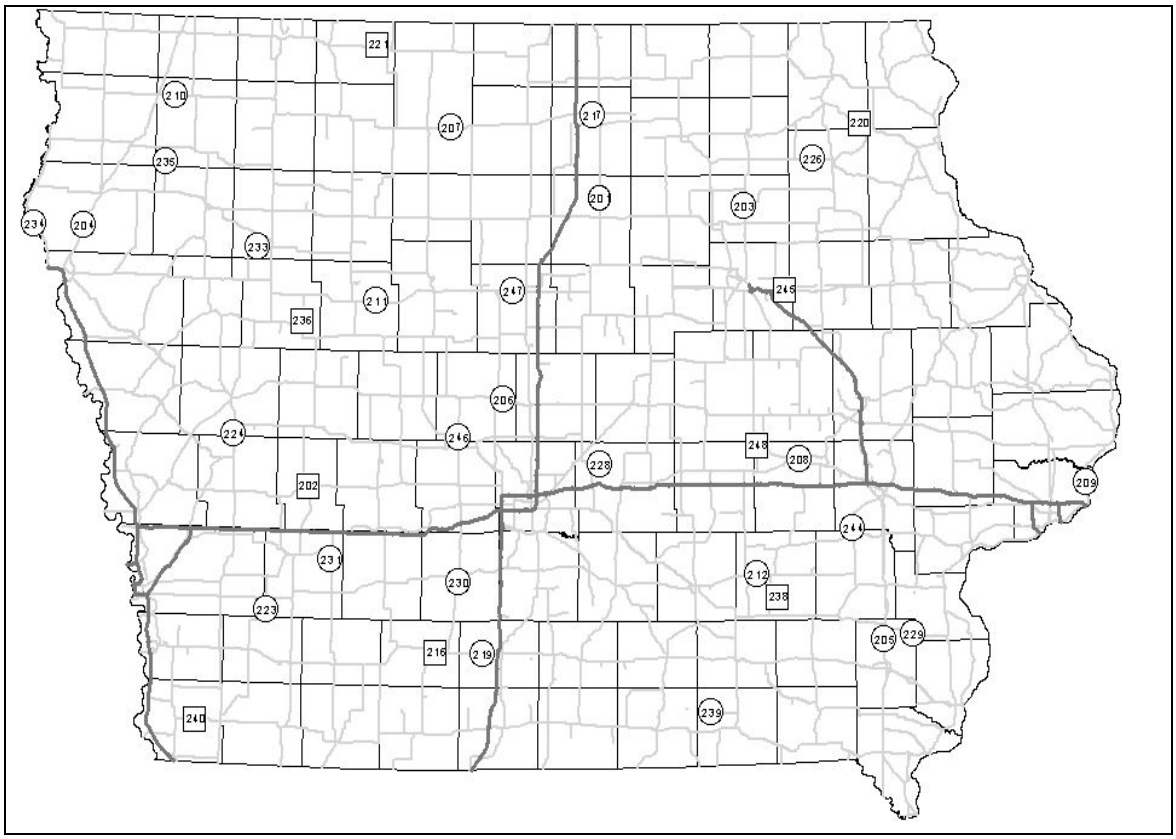


Figure 5.1. Location of rural primary ATR stations

AADT by vehicle category and for total traffic for each ATR station was computed using the American Association of State Highway and Transportation Officials (AASHTO) method—a three-step averaging process. This method was used instead of the simple average of days approach because it has the advantage of effectively removing most biases that result from missing days of data. This advantage is especially important when those missing days are unequally distributed across months or days of the week by weighting each day of the week and each month the same regardless of how many days are actually present within that category (FWHA 2001).

In the first step of this process, 7 averages corresponding to the 7 days of the week were obtained for each month of the year for each vehicle category and total traffic. These 84 (12 months by 7 days) monthly average days of the week traffic (MADWT) volumes are then averaged across all 12 months to yield 7 annual average days of the week (AADW). The 7 AADW values are averaged to produce AADT.

The AASHTO approach for computing AADT can be expressed as follows:

$$AADT_c = \frac{1}{7}\sum_{i=1}^{7}\left[\frac{1}{12}\sum_{j=1}^{12}\left(\frac{1}{n}\sum_{k=1}^{n} VOL_{ijk}\right)\right] \qquad (5\text{-}1)$$

where

$AADT_c$ = Annual average daily traffic for vehicle category c
VOL = Daily traffic for day k, of day-of-week i, and month j
I = Day of the week
j = Month of the year
k = 1 when the day is the first occurrence of that day of the week in a month and 4 when it is the fourth day of the week
n = The number of days of that day of the week during that month (usually between 1 and 5, depending on the number of missing data)

5.3.2 Expansion Factors

For each ATR station, different expansion factors for each day of the week of a specific month were developed. The combined seasonal and day-of-week expansion factor is given by the ratio of the annual average daily traffic (AADT) to the monthly average day of the week traffic (MADWT), as shown in Equation 5-2:

$$f_{atrgi} = \frac{AADT_c}{MAWDT_c} \quad (5\text{-}2)$$

where

f_{atrgi} = Combined seasonal and day-of-week factor for vehicle category c for station i
$ADDT_c$ = Annual average daily traffic for vehicle category c for station i
$MAWDT_c$ = Monthly average day-of-week traffic for vehicle category c for station i

Table 5.2 illustrates data used to calculate AADT for rural interstate Station 119. The dataset includes all vehicles. The daily average was calculated by summing AADT for a specific day of the week over the 12 months and then dividing by 12. Final AADT was calculated by summing the daily average over the 7 days and dividing by 7.

Table 5.2. Volumes by day-of-week AADT for Station 119

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Daily Avg
Mon	19336	21138	22389	24164	25994	27160	28123	28656	26476	24869	23713	19957	24331
Tue	21365	21131	22946	24126	25562	26473	27768	27851	25296	24278	24705	21274	24398
Wed	21927	21155	23950	24975	26292	27948	26620	29120	26255	25223	28055	24798	25527
Thu	22510	21875	24350	26798	27717	29582	30080	30388	28207	26735	24412	25453	26509
Fri	23588	22797	27354	30026	32258	33640	34560	35574	32339	31079	27407	28241	29905
Sat	19681	18727	22464	22780	25609	28266	29026	30396	26539	24706	24637	23581	24701
Sun	17373	18495	22394	23804	24567	27973	30120	30423	26317	26690	26765	19931	24571
AADT													25706

Resulting expansion factors (f_c) are presented in Table 5.3. Data are shown for Station 119. The expansion factors are shown for all vehicles. Expansion factors were calculated using Equation 5-2. The expansion factor for a Monday in January, for instance, was calculated by dividing 25706 by 19336, which equals 1.33.

Table 5.3. Expansion factors for Station 119

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mon	1.33	1.22	1.15	1.06	0.99	0.95	0.91	0.90	0.97	1.03	1.08	1.29
Tue	1.20	1.22	1.12	1.07	1.01	0.97	0.93	0.92	1.02	1.06	1.04	1.21
Wed	1.17	1.22	1.07	1.03	0.98	0.92	0.97	0.88	0.98	1.02	0.92	1.04
Thur	1.14	1.18	1.06	0.96	0.93	0.87	0.85	0.85	0.91	0.96	1.05	1.01
Fri	1.09	1.13	0.94	0.86	0.80	0.76	0.74	0.72	0.79	0.83	0.94	0.91
Sat	1.31	1.37	1.14	1.13	1.00	0.91	0.89	0.85	0.97	1.04	1.04	1.09
Sun	1.48	1.39	1.15	1.08	1.05	0.92	0.85	0.84	0.98	0.96	0.96	1.29

5.4 *N*-Fold Cross-Validation

N-fold cross-validation was used to evaluate the three methods. In *n*-fold cross-validation, data are split into *n* partitions and data from the *n*th partition are used to validate the model created from the remaining data. For example, if four partitions are used, for the first partition, data from partition *n*=1 are removed from the sample and data from partitions *n*=2, *n*=3, and *n*=4 (referred to hereafter as the "model" dataset) are combined to create the model of interest. Data from partition *n*=1 (refereed to hereafter as the "validation" dataset) are used to validate the model. For the second partition, data from partition *n*=2 are removed and data from *n*=1, *n*=3, and *n*=4 are used to create the model. Data from partition *n*=2 are used to validate the model. Partitions 3 and 4 follow the same method.

The 36 rural primary ATR stations were randomly partitioned into four groups of nine stations. The four groups are presented in Table 5.4. The 14 rural interstate ATR stations were divided into four groups, as shown in Table 5.5.

Table 5.4. Division of rural primary ATR stations

	Group 1	Group 2	Group 3	Group 4
ATR Station	201	202	203	204
	205	206	207	208
	209	210	211	212
	220	216	217	219
	224	221	228	223
	230	226	233	229
	235	231	238	234
	240	236	246	239
	244	245	248	247

Table 5.5. Division of rural interstate ATR stations

	Group 1	Group 2	Group 3	Group 4
ATR Station	120	100	119	116
	106	113	104	110
	109	115	118	111
		102		

5.5 Short-term Counts

Short-term counts were used to evaluate the accuracy of each of the three methods. For each partition, stations from the model datasets were used to create expansion factors, and stations from the validation dataset were used to create short-term counts. Expansion factors for each model dataset were computed for the two truck (SU and MU) categories and for total traffic by averaging expansion factors for all ATR stations in a model dataset creating an average factor for the group:

$$F_{cg_{av}} = \frac{\sum_{i=1}^{m} f_{atr_{gi}}}{m} \quad (5\text{-}3)$$

where

$F_{cg_{av}}$ = Average expansion factor for vehicle category c in group g

$f_{atr_{gi}}$ = Expansion factor for station i in group g

c = Vehicle category

g = ATR group

m = Number of ATR stations in group g

Consequently, expansion factors were created for both rural interstate and primary roads for each partition n for each vehicle type. For each partition, factors were created for total vehicles, single-unit trucks, and multi-unit trucks. An example is shown in Table 5.6 for single-unit vehicles for rural interstates for partition 1.

Table 5.6. SU expansion factors for rural interstate group 1

Group 1	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mon	1.56	1.16	1.18	1.01	0.99	0.88	0.81	0.86	1.00	1.05	1.24	1.66
Tue	1.29	1.17	1.16	1.02	0.95	0.91	0.83	0.91	1.05	1.09	1.23	1.54
Wed	1.17	1.22	1.10	1.00	0.93	0.84	0.91	0.82	1.03	1.02	1.14	1.34
Thu	1.16	1.15	1.09	0.94	0.87	0.76	0.76	0.77	0.91	0.94	1.21	1.25
Fri	1.15	1.23	1.01	0.86	0.75	0.63	0.62	0.64	0.79	0.86	1.07	1.14
Sat	1.74	1.70	1.47	1.24	1.10	0.81	0.78	0.79	1.03	1.17	1.37	1.70
Sun	2.26	2.11	1.73	1.36	1.31	0.99	0.88	0.86	1.18	1.33	1.56	2.20

Data from stations reserved as validation datasets were used to create short-term count datasets. The Iowa DOT collects short-term counts from June to August. The summer

DOT counting period was also used for analysis. Four days were randomly selected for each of the 3 summer months (June, July, and August), and 24-hour counts were extracted from the validation dataset for weekdays (Monday through Thursday). For each day, a 24-hour classification count was extracted from each station in the validation dataset. For instance, if nine stations were present in the validation dataset, a total of 9 x 3 x 4, or 108 individual 24-hour counts, would have been extracted for each partition. The days used in the analysis were the following:

June 6	July 9	Aug 8
June 11	July 18	Aug 14
June 19	July 26	Aug 23
June 28	July 31	Aug 27

AADT was estimated for each station from each 24-hour count using the expansion factors for each method. The actual AADT for each vehicle category was calculated using Equation 5-1 for each station and was compared to the estimated AADT by vehicle category generated using each method.

5.6 Description of Three Methods

AADT was estimated for each vehicle category for each 24-hour count for each partition for each of the three methods. Each method is described in more detail in the following sections.

5.6.1 Truck Expansion Factor Approach

This approach involved developing separate expansion factors for single-unit (SU) and multi-unit (MU) trucks. Expansion factors were used to estimate annual average daily truck traffic (AADTT) for each truck category using the 24-hour counts. AADTT was calculated using Equation 5-4 for each validation station for each partition. Expansion factors were created, as discussed previously, by averaging expansion factor for the model dataset for each partition.

$$AADTT_c = V_{c_{24}} \times f_c \qquad (5\text{-}4)$$

where

$AADTT_c$ = Annual average daily truck traffic for truck category c

$V_{c_{24}}$ = 24-hour short-term truck count for truck category c

f_c = Averaged seasonal and day-of-week adjustment factor for truck category c

In order to use this approach, short-duration truck counts must be collected as part of the traffic monitoring program.

5.6.2 Yearly Truck Percentage Approach

This approach calculated a single expansion factor for all vehicles for each partition. Truck AADT was calculated for each validation station using Equation 5-5. Truck AADT

was calculated by multiplying AADT for all vehicles by a yearly truck percentage. The percentage of single-unit and multi-unit trucks for each partition was calculated by summing the number of trucks in each category for all the stations in the "model" dataset and dividing that by total AADT for the stations, as shown in Equation 5-6.

$$AADTT_c = P_c \times [V_{t_{24}} \times f_t] \tag{5-5}$$

where

P_c = Average yearly truck percentage for truck category c

$V_{t_{24}}$ = 24-hour short-term volume count for total traffic for station i

f_t = Averaged seasonal and day-of-week adjustment factor for total traffic

$$P_c = \frac{\sum_{j=1}^{12}\left(\sum_{i=1}^{n} truckVol_{mij}\right)}{\sum_{j=1}^{12}\left(\sum_{i=1}^{n} Vol_{ij}\right)} \tag{5-6}$$

where

P_c = Annual truck percentage for truck category m

$truckVol_{mij}$ = Truck volume for truck category m for day i in month j

Vol_{ij} = Total traffic volume for day i in month j

i = Day of the month

j = Month of the year

Unlike in the first approach, the collection of short-term truck counts is not required. The truck percentages are developed from vehicle classification data and are given by the ratio of truck volume to total traffic volume. Yearly truck percentages for rural interstates for each partition are provided in Table 5.7. Percentages for rural primary roads are shown in Table 5.8 for each partition.

Table 5.7. Average truck percentage by partition for each vehicle category for rural interstate road

Partition	PC	SU	MU
n = 1	75.6%	3.3%	21.1%
n = 2	70.7%	3.2%	26.1%
n = 3	73.6%	3.1%	23.3%
n = 4	75.0%	3.0%	22.0%

Table 5.8. Average truck percentage by partition for each vehicle category for rural primary road

Partition	PC	SU	MU
$n = 1$	86.0%	4.4%	9.6%
$n = 2$	85.6%	4.5%	10.0%
$n = 3$	85.8%	4.6%	9.6%
$n = 4$	85.6%	4.5%	9.9%

5.6.3 Count Specific Truck Percentage Approach

Expansion factors that represented all vehicle categories combined were calculated for each validation station for each partition the same way as for method 2. Total AADT was factored for each validation station from each 24-hour count using expansion factors. Single-unit and multi-unit AADT were calculated by multiplying truck percentages for each category. Truck percentages for this method were based on the 24-hour classification count. Consequently, the percentages of single-unit and multi-unit trucks were calculated separately for each validation station for each 24-hour count according to Equation 5-7.

$$P_c = \frac{T_c}{Vol_{24}} \quad (5\text{-}7)$$

where

P_c = Percentage of trucks in category c
T_c = 24-hour volume of trucks for category c
Vol_{24} = Total 24-hour volume

5.7 Cross-Validation

N-fold cross-validation was the method used to evaluate the accuracy of AADT computed using the three different estimation methods. As discussed above, one dataset was reserved as the validation dataset, and expansion factors were calculated using the remaining model datasets. Four partitions were used for both the rural interstate and rural primary road categories. Truck AADT was estimated for each station in the validation dataset for each of the 24-hour counts using the three different methods, as described previously.

5.7.1 Comparison of Methods

A 4-fold cross-validation was performed. One partition was reserved for testing, while the other 3 partitions were used for fitting the model. This procedure was repeated until all four partitions were used as a test set. The 4-fold cross-validation was applied to the ATR data using the 3 methods for estimating AADTT, as discussed. A comparison of the accuracy of the 3 methods was made using the estimates of prediction error obtained

from cross-validation. The prediction error was determined by averaging the squared error between the estimated AADTT and the actual AADTT, as shown in Equation 5-8.

$$MSEP = \frac{\sum \left(AADTT_{est} - AADTT_{actual} \right)^2}{n} \quad (5\text{-}8)$$

where

$MSEP$ = Mean squared error of prediction

$AADTT_{est}$ = Estimated annual average daily truck traffic from a particular method

$AADTT_{true}$ = Actual annual average daily truck traffic

n = Number of observations

5.7.2 Results of Cross-Validation

To perform an accuracy assessment of the results obtained from the three AADT estimation methods, the estimates of the mean squared error of prediction (MSEP) for the methods obtained from cross-validation were compared. On average, the smaller the MSEP, the less errors in the predictions and, consequently, the better the method. Observed MSEP values for the three methods are given in Table 5.9 for the rural primary category. Values are averaged over all days and stations. Average MSEP for each station for single-unit trucks is presented in Table 5.10 and for multi-unit trucks in Table 5.11.

The results for single-unit trucks for rural primary roads show that the estimated MSEP for the truck expansion factor method (method 1) is 2,354, the corresponding MSEP for the annual truck percentage method (method 2) is 11,942, and the MSEP for the daily truck percentage method (method 3) is 2,595. Thus, for single-unit trucks, the truck expansion factor method performed the best in terms of minimum expected error. In the case of multi-unit trucks, the results show that the MSEP for method 1 is 12,341, the corresponding MSEP for method 2 is 98,837, and the MSEP for method 3 is 28,773. Again, the best method in terms of minimum prediction error is the truck expansion factor method.

Table 5.9. Average mean squared error of prediction for rural primary roads

	Average MSEP for All Days and Stations		
	Truck Expansion Factor Method (1)	**Annual Truck Percentage Method (2)**	**Count Specific Truck Percentage Method (3)**
Single-Unit	2,354	11,942	2,595
Multi-Unit	12,341	98,837	28,773

Table 5.10. Average mean squared error of prediction by station for rural interstate roads for single-unit vehicles

Station	Average MSEP for Each Station		
	Truck Expansion Factor Method (1)	Annual Truck Percentage Method (2)	Count Specific Truck Percentage Method (3)
201	4393	126	3933
205	451	15510	1199
209	1356	3613	2667
220	319	98	586
224	2986	36390	1154
230	127	164	159
235	100	19	182
240	103	70	157
244	294	10677	475
202	1934	4634	2017
206	1762	66413	2589
210	1151	300	1419
216	750	1000	864
221	804	58	745
226	1746	64	1969
231	57	33	172
236	405	47	494
245	1675	1675	1675
203	6902	1040	6962
207	1793	1226	2116
211	1042	20	830
217	11215	197932	12018
228	4050	935	4135
233	214	763	336
238	160	68	202
246	17042	45724	18086
248	1928	4099	1814
204	4191	39816	6142
208	1753	1353	2440
212	1176	3226	629
219	13119	8082	14718
223	784	45	981
229	84	87	98
234	771	62	994
239	121	260	108
247	1483	10715	5245

Table 5.11. Average mean squared error of prediction by station for rural interstate roads for multi-unit vehicles

Station	Average MSEP for Each Station		
	Truck Expansion Factor Method (1)	**Annual Truck Percentage Method (2)**	**Count Specific Truck Percentage Method (3)**
201	228557	834	379230
205	21046	652003	155548
209	1188	22094	7121
220	8085	4991	25150
224	3809	48323	5929
230	57	13681	290
235	249	912	976
240	562	3139	1234
244	894	131228	1244
202	752	19664	3154
206	3730	347525	24832
210	1355	2557	8816
216	1708	2505	8058
221	1892	2608	4597
226	5561	2811	19757
231	111	1233	431
236	928	1839	2986
245	12590	1258	66899
203	5452	105929	22129
207	2425	239	6837
211	39814	131449	11001
217	6791	1217586	20400
228	4967	4098	11539
233	432	2955	1254
238	140	1585	207
246	58890	239169	91912
248	1603	1798	321
208	512	70565	1584
212	399	5997	5571
219	1806	4556	8081
223	350	6798	858
229	394	1065	799
234	1696	233	4904
239	52	2863	83
247	17100	494516	257806

Average MSEP for the rural interstate category is presented in Table 5.12. Shown is the average MSEP for all days and all stations. Average MSEP by station for single-unit trucks is presented in Table 5.13 and for multi-unit trucks in Table 5.14. As shown overall, the mean squared error is lowest for the method that developed expansion factors

separately for the different truck groups for both the single- and multi-unit truck categories (method 1). For some stations, different methods produce different results, but the average MSEP is lowest overall for that method.

Table 5.12. Average mean squared error of prediction for rural interstate

	Average MSEP for All Days and Stations		
	Truck Expansion Factor Method (1)	**Daily Truck Percentage Method (2)**	**Annual Truck Percentage Method (3)**
Single-Unit	34,028	61,490	161,331`
Multi-Unit	698,851	1,700,949	10,623,191

Table 5.13. Observed mean squared error of prediction for rural interstate for SU vehicles

Station	Average MSEP for Each Station		
	Truck Expansion Factor Method (1)	**Daily Truck Percentage Method (2)**	**Annual Truck Percentage Method (3)**
1000	10,605	12,935	6,446
1020	4357	4570	23979
1040	3,875	13,462	19,083
1060	33,283	10,987	67,835
1090	19,404	40,435	2,656
1100	151,233	128,080	89,939
1110	30,378	71,420	268,078
1130	914	2,955	449
1150	19,013	88,346	16,597
1160	105,470	205,378	73,991
1180	48,028	152,219	1,004,315
1190	8,823	28,564	202,026
1200	6,977	40,020	321,916

Table 5.14. Observed mean squared error of prediction for rural interstate for MU vehicles

Station	Average MSEP for Each Station		
	Truck Expansion Factor Method (1)	**Daily Truck Percentage Method (2)**	**Annual Truck Percentage Method (3)**
1000	7,599	89,369	4,317,140
1020	52,221	239,339	275,992
1040	71,780	503,876	634,217
1060	55,192	307,571	879,533
1090	115,361	551,819	86,126
1100	7,036,514	14,294,839	8,672,671
1110	256,355	1,555,521	4,436,701
1130	32,058	184,502	193,389
1150	302,891	406,634	4,996,260
1160	536,091	475,280	238,742
1180	211,889	976,603	103,888,065
1190	161,179	761,648	880,880
1200	245,936	1,765,337	8,601,773

5.8 Hourly, Weekly, and Monthly Variations

In addition to testing the different methods using *n*-fold cross-validation, the different methods were also graphically compared. Figure 5.1 illustrates the fraction of monthly volume that occurs on a specific month of the year for four rural interstate stations. As shown, passenger vehicle and single-unit truck patterns are more similar than multi-unit truck pattern. Passenger and SU volumes peak in the summer months, while MU volumes are more constant over the year. Figure 5.2 illustrates weekly variation for four rural interstate stations. In general, higher truck volumes occur during the weekdays (Monday through Friday), with much lower volumes on weekends for both truck groups. Passenger vehicles peak on Friday and have higher weekend volumes. Figures 5.3 and 5.4 show volume variations by hour of the day for the same four interstate stations. Figure 5.3 shows data for a typical Monday in July, and Figure 5.4 shows a typical Saturday in July. As shown, passenger vehicle and single-unit truck volumes follow similar hour trends, while multi-unit trucks have a much flatter curve. On Mondays, the multi-unit truck curve peaks later in the day. On Saturdays, the trend is similar but flatter than for the other two vehicle categories.

Figure 5.5 illustrates monthly variation in vehicle volumes for four rural primary stations. Volume trends for multi-unit trucks and passenger vehicles for three of the stations are more similar than for single-unit trucks. Weekly variations for the four rural primary stations are provided in Figure 5.6. As shown, truck volumes peak on Monday through Friday and then drop on Saturday and Sunday, while passenger vehicle volumes peak on Fridays and weekends are similar to weekdays. Figures 5.7 and 5.8 illustrate hourly variation for the same station for a typical Monday and Saturday in July, respectively. As shown, multi-unit truck volumes have significant variations throughout the day, while single-unit and passenger vehicles follow a smoother trend.

As shown, weekly and monthly truck patterns are different from passenger vehicle patterns. The *n*-fold cross-validation confirmed that using truck specific expansion factors resulted in more accurate estimates of truck AADT and, consequently, truck VMT. Graphical comparison indicated the same conclusion.

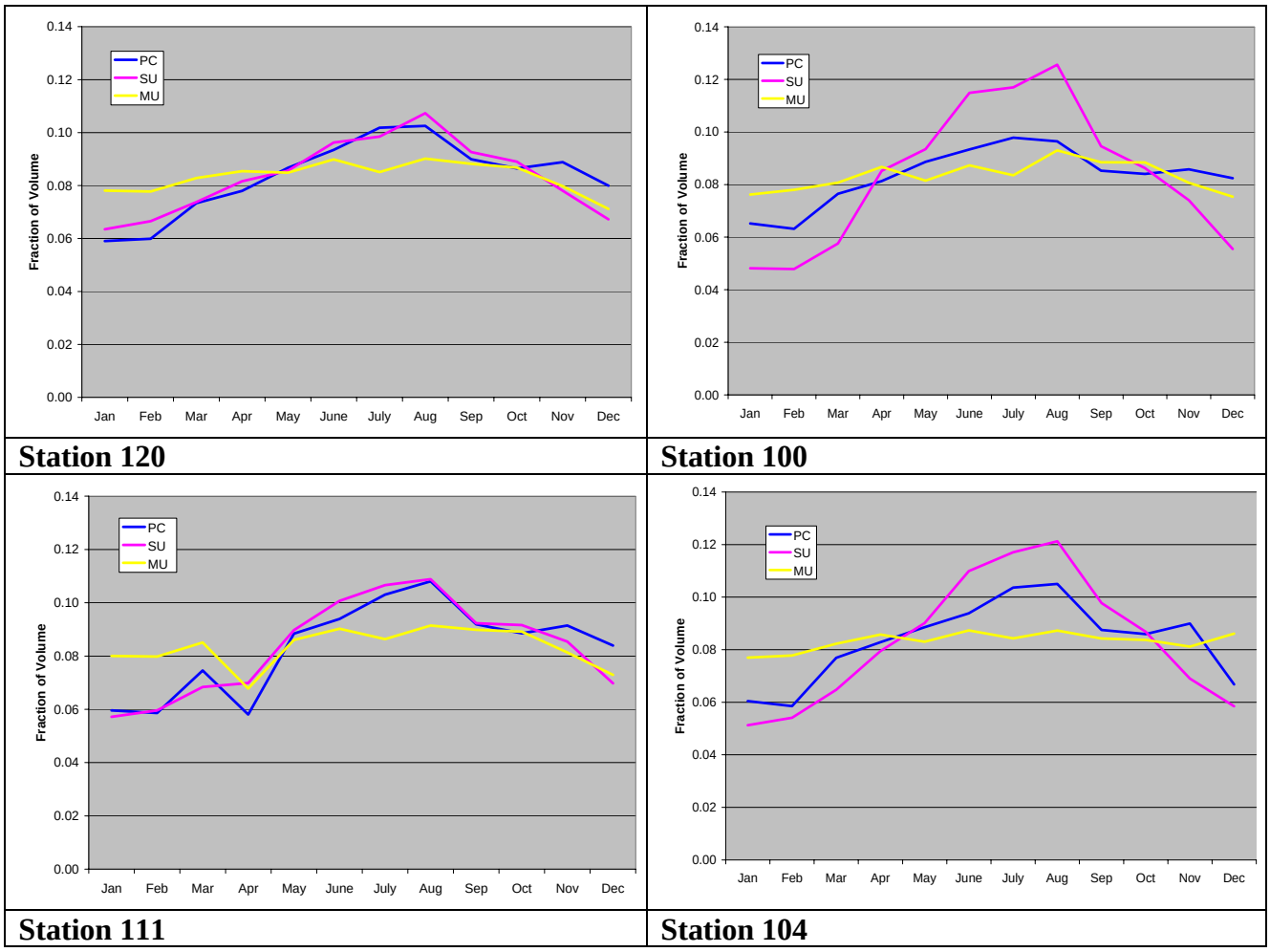


Figure 5.1. Monthly variations for rural interstate stations

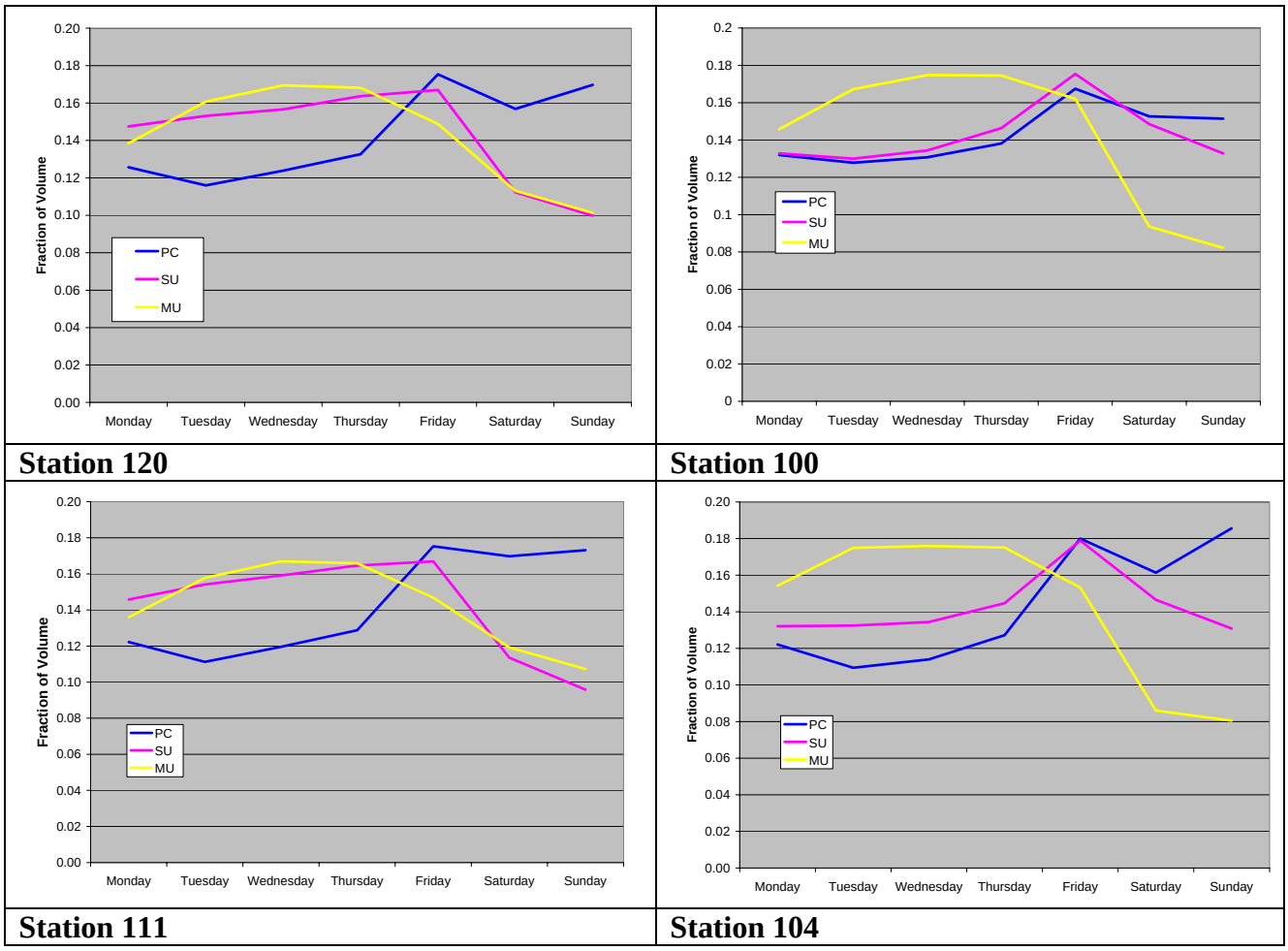


Figure 5.2. Weekday variations for rural interstate stations

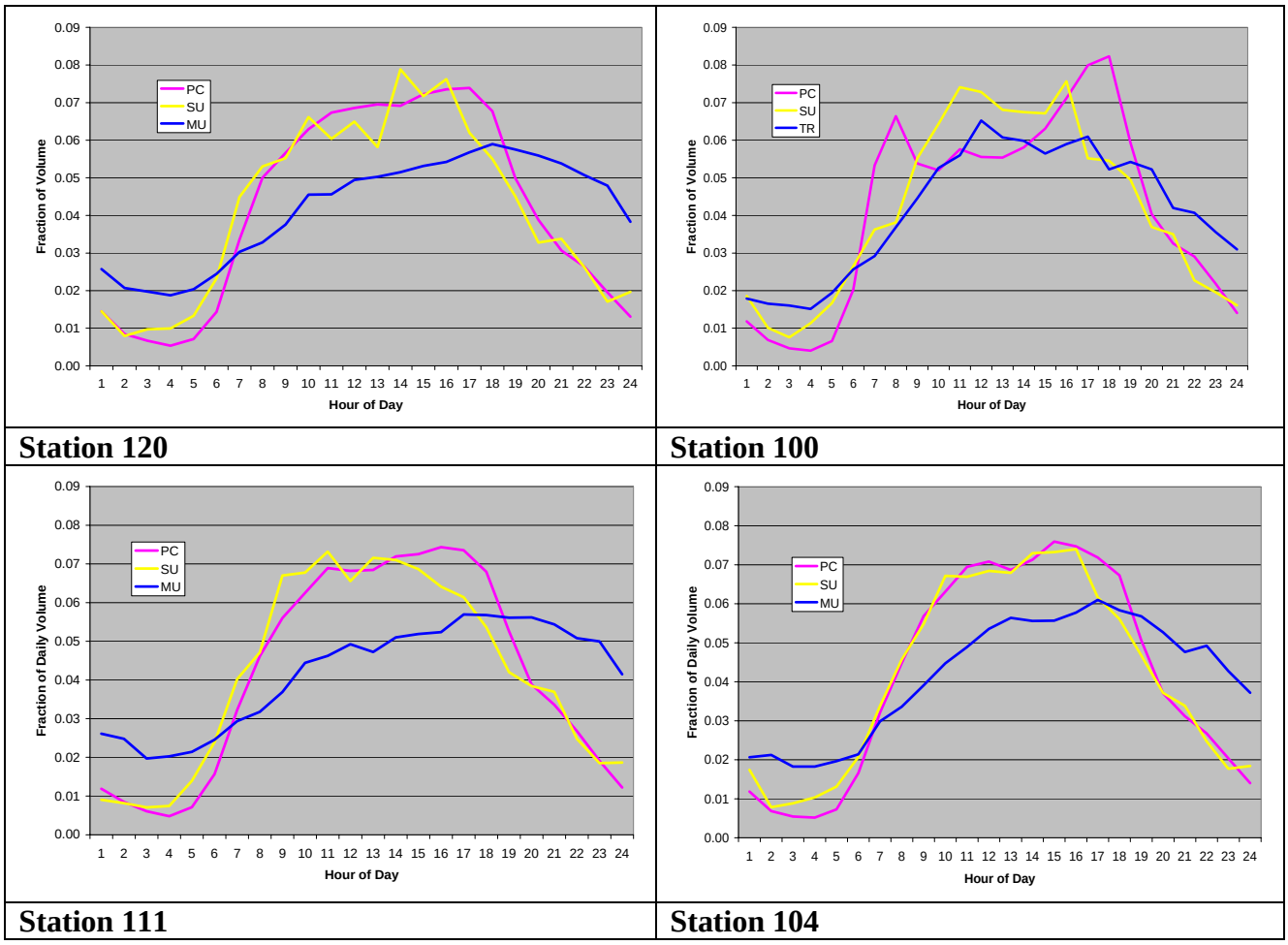


Figure 5.3. Weekday variations for rural interstate stations (Monday in July)

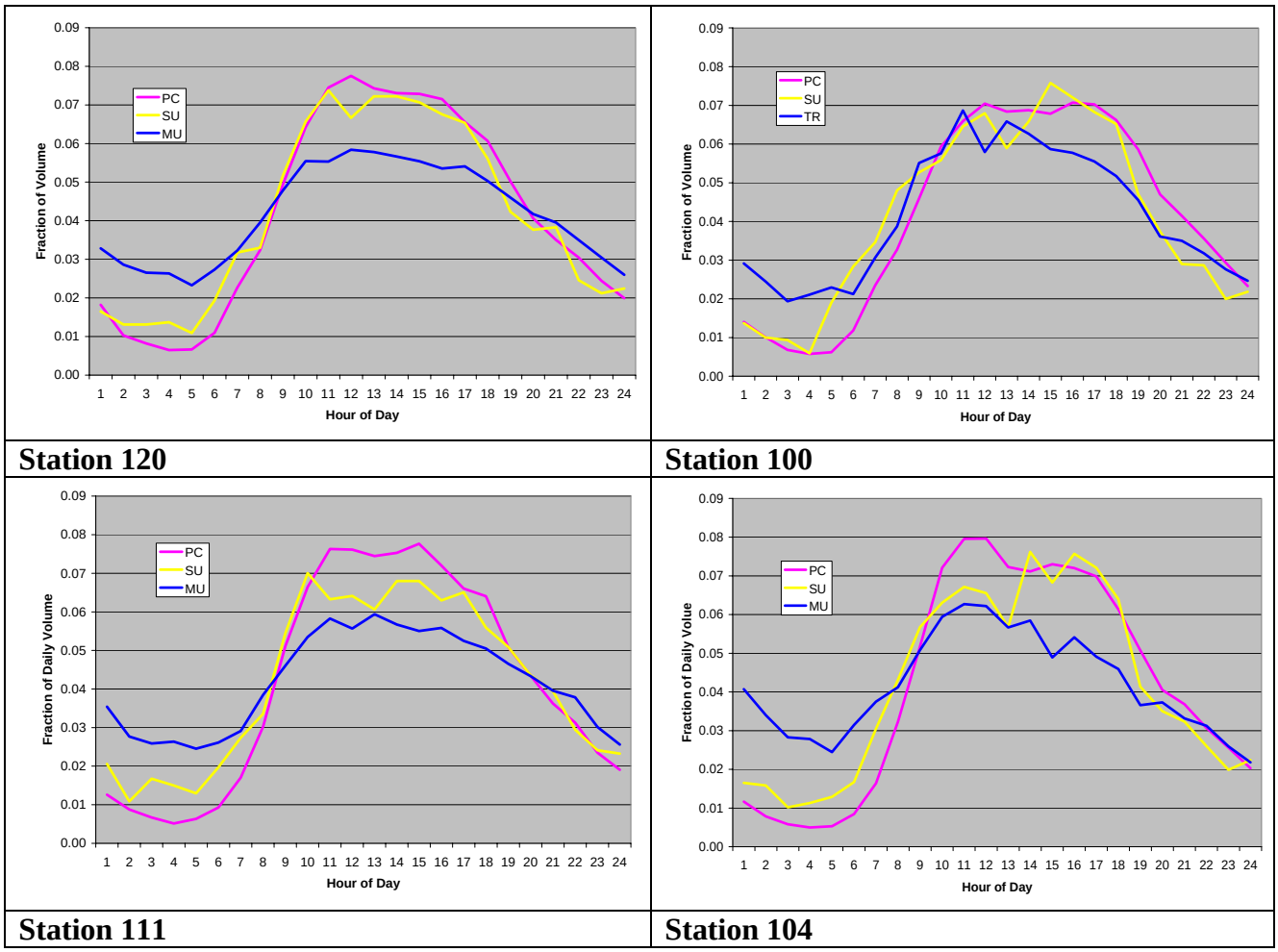


Figure 5.4. Weekday variations for rural interstate stations (Saturday in July)

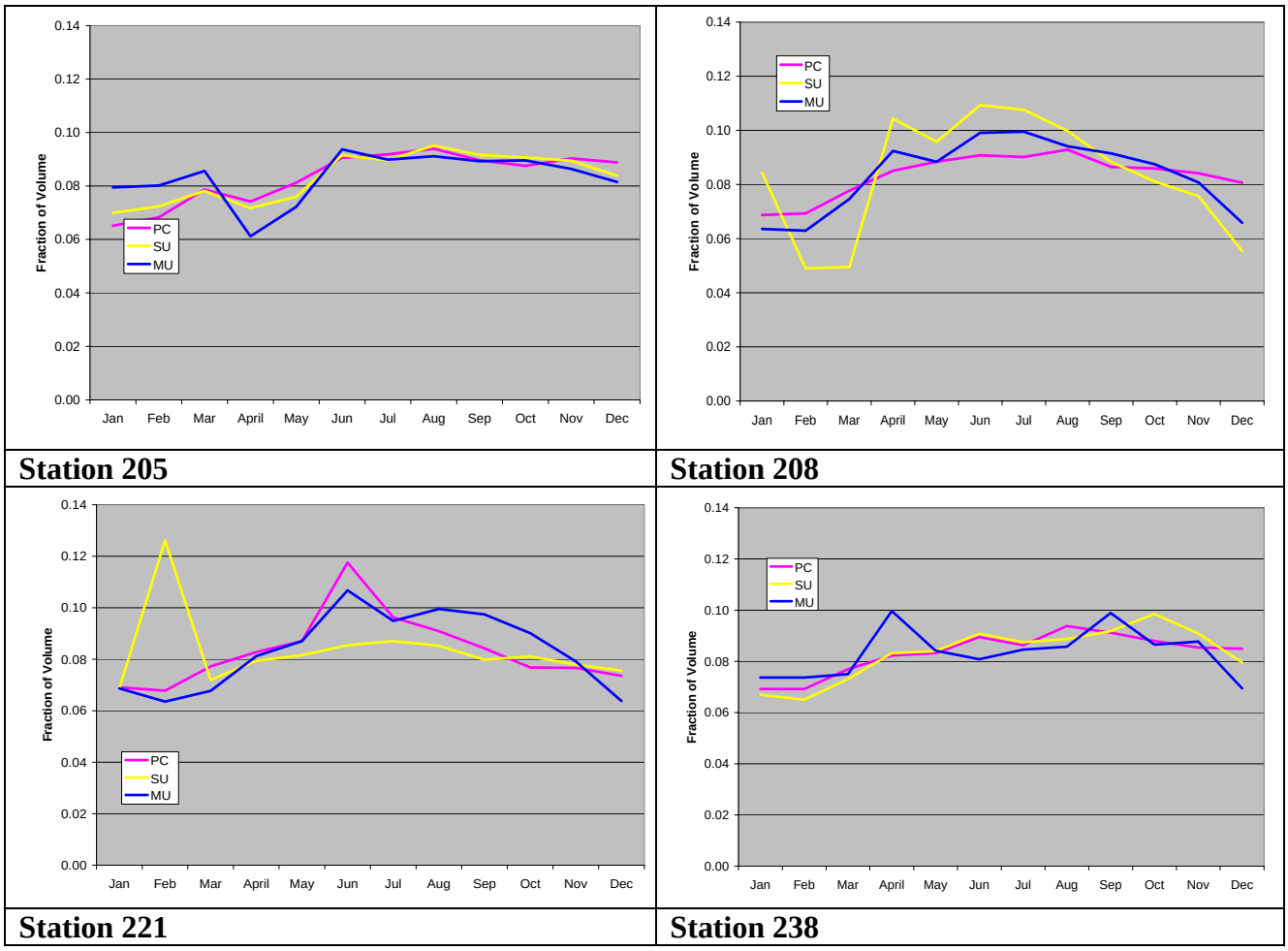


Figure 5.5. Monthly variations for rural primary stations

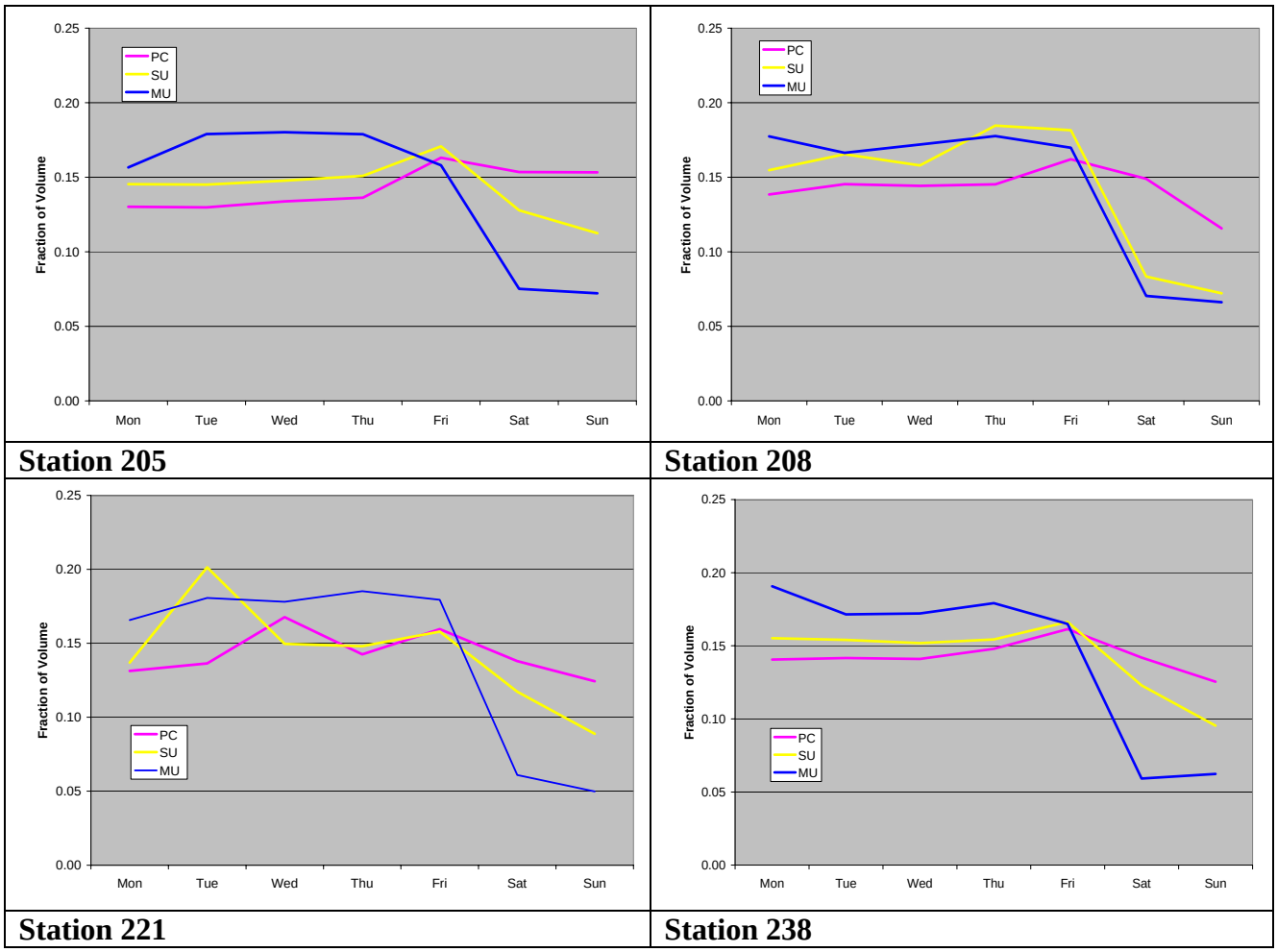
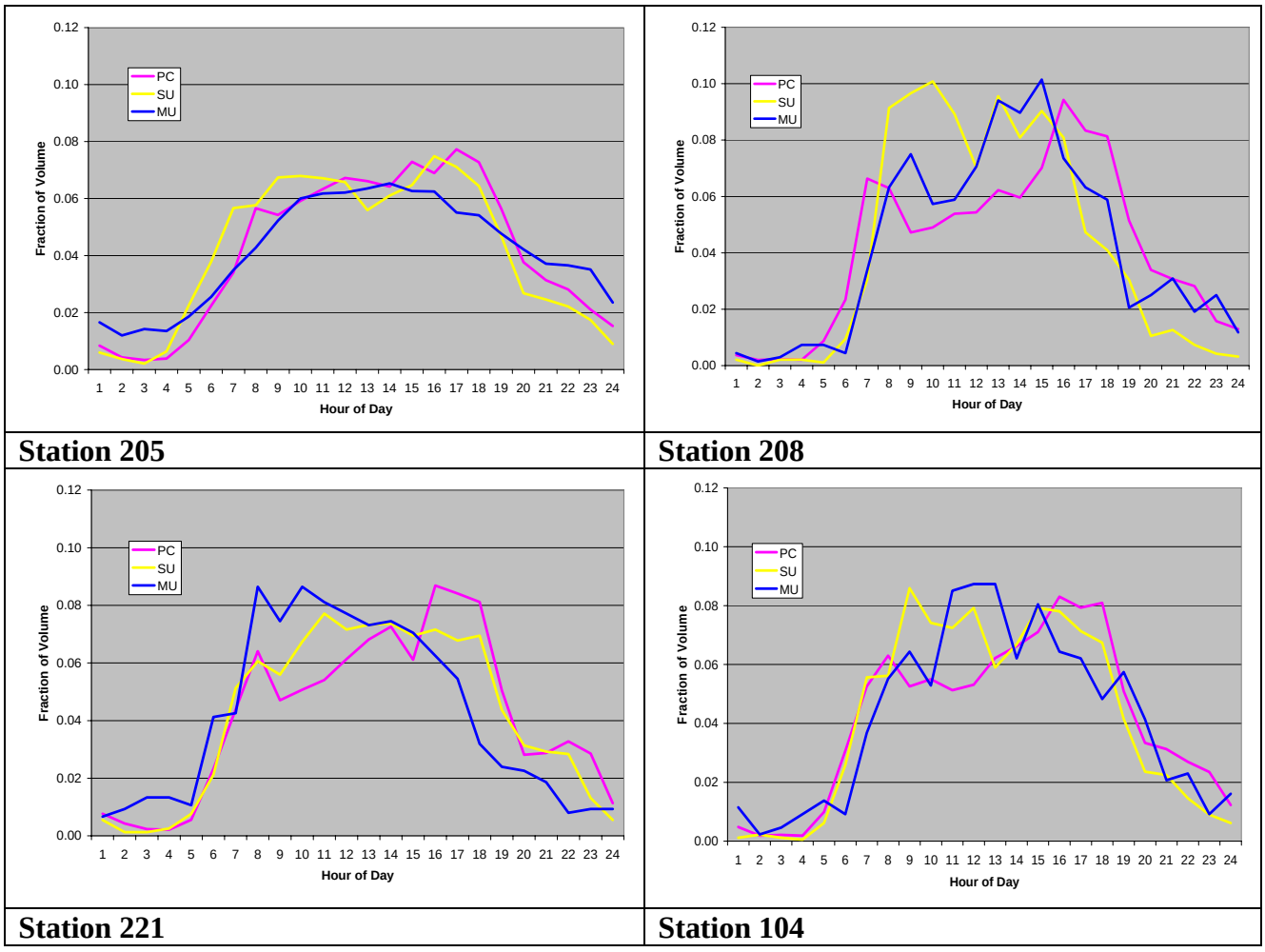


Figure 5.6. Weekly variations for rural primary stations



Station 205 | **Station 208**

Station 221 | **Station 104**

Figure 5.7. Daily variations for rural primary stations (Monday in July)

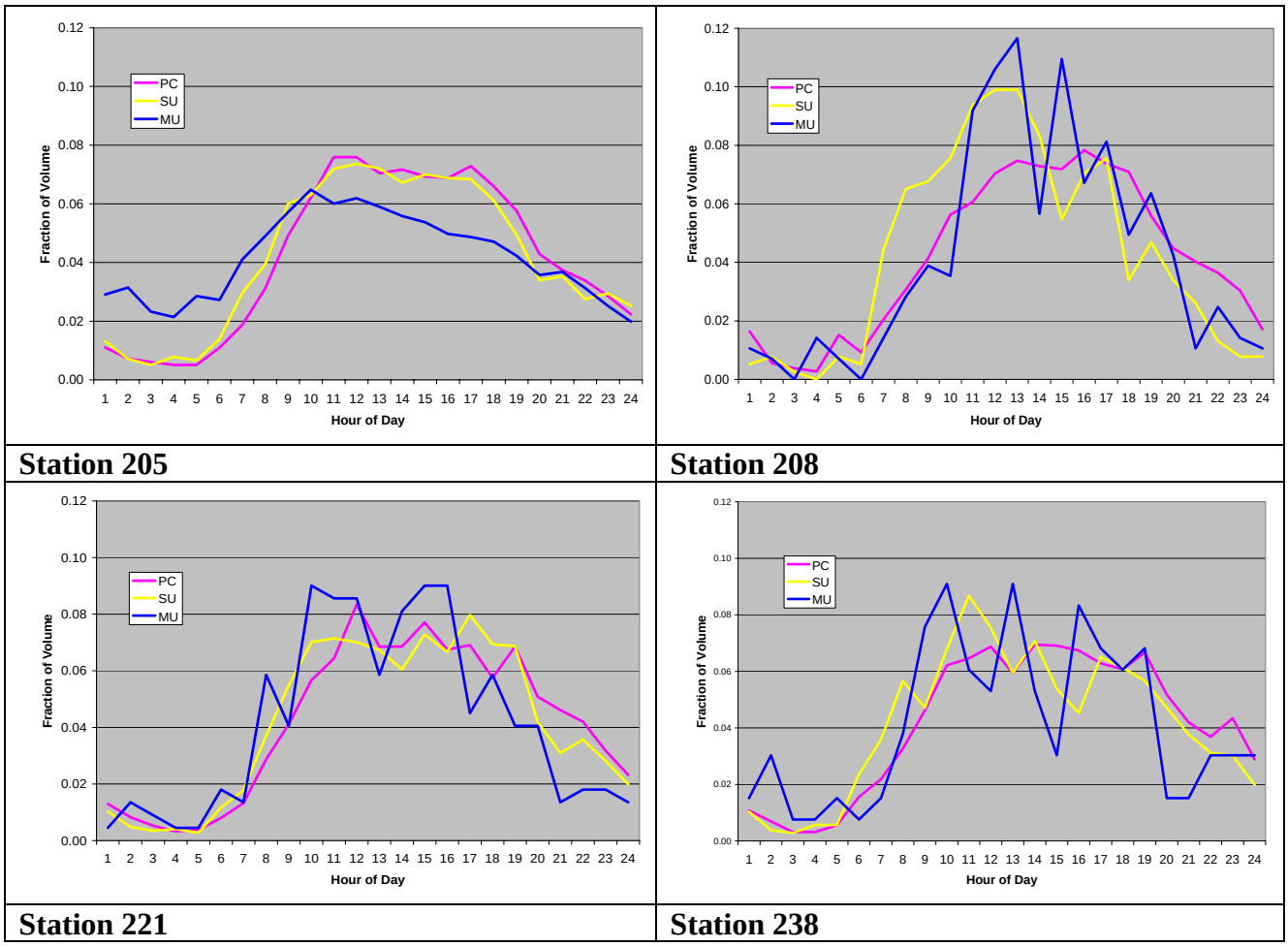


Figure 5.8. Daily variations for rural primary stations (Saturday in July)

6. SUMMARY AND CONCLUSIONS

This research evaluated three different methods to calculate heavy-truck AADT and, subsequently, VMT. Traffic data from continuous count stations provided by the Iowa DOT were used to estimate AADT for two different truck groups (single-unit and multi-unit) using the three methods. The first method developed monthly and daily expansion factors for each truck group. Truck AADT was calculated by applying truck expansion factors to short-term counts. The second and third methods created general expansion factors for all vehicles. Truck AADT was calculated by multiplying short-term counts by generic expansion factors and truck percentages. Truck percentages for the second method were based on the annual percentage of trucks for each group from continuous count stations. The third method used daily truck percentages from short-term counts.

Accuracy of the three methods was compared using *n*-fold cross-validation. In *n*-fold cross-validation, data are split into *n* partitions, and data from the *n*th partition is used to validate the remaining data. Accordingly, data from continuous count stations were divided into four groups, and each group was reserved for one partition as the validation dataset. Short-term counts were extracted from the validation dataset, and then AADT was estimated using each of the three methods. Actual AADT by truck group for each count station was compared to the estimated AADT by truck group for each method.

Data were analyzed for rural primary and rural interstate roadways. Data from continuous count stations for the 2001 counting year were used. Although 2002 data were available, the DOT felt that there had been significant problems with data quality and suggested use of the 2001 data. A total of 36 rural primary ATR stations and 14 rural interstate stations were used. Data were analyzed for two truck categories: single unit trucks (SU), which was composed of FHWA vehicle classes 4 to 7, and multi-unit trucks (MU), which included FHWA vehicle classes 8 to 13.

To perform an accuracy assessment of the results obtained from the three methods, the estimates of the mean squared error of prediction (MSEP) obtained from cross-validation were compared. On average, the smaller the MSEP, the less errors in the predictions and, consequently, the better the method.

The results for rural primary roadways for single-unit trucks show that the estimated MSEP for the truck expansion factor method (method 1) was 2,354, the corresponding MSEP for the annual truck percentage method (method 2) was 11,942, and the MSEP for the daily truck percentage method (method 3) was 2,595. Thus, for single-unit trucks, the truck expansion factor method performed the best in terms of minimum expected error. In the case of multi-unit trucks, the results show that the MSEP for method 1 was 12,341, the corresponding MSEP for method 2 was 98,837, and the MSEP for method 3 was 28,773. Again, the best method in terms of minimum prediction error was the truck expansion factor method.

Similar results were found for the rural interstate category. The mean squared error was lowest for the method that developed expansion factors separately for the different truck

groups for both the single- and multi-unit truck categories (method 1). For single-unit trucks, the MSEP was 34,028 for method 1, 61,490 for method 2, and 161,331 for method 3. For multi-unit trucks, the MSEP was 698,851 for method 1, 1,700,949 for method 2, and 10,623,191 for method 3. For some stations, different methods produce different results, but the average MSEP was lowest for that method.

Overall, the prediction error was the lowest for the method that developed expansion factors separately for the different truck groups for both single- and multi-unit trucks. This indicates that use of expansion factors specific to heavy trucks results in better estimates of AADT and, subsequently, VMT than using aggregate expansion factors and applying a percentage of trucks.

Monthly, daily, and weekly traffic patterns were also evaluated. Significant variation exists in the temporal and seasonal patterns of heavy trucks as compared to passenger vehicles. This suggests that the use of aggregate expansion factors fails to adequately describe truck travel patterns.

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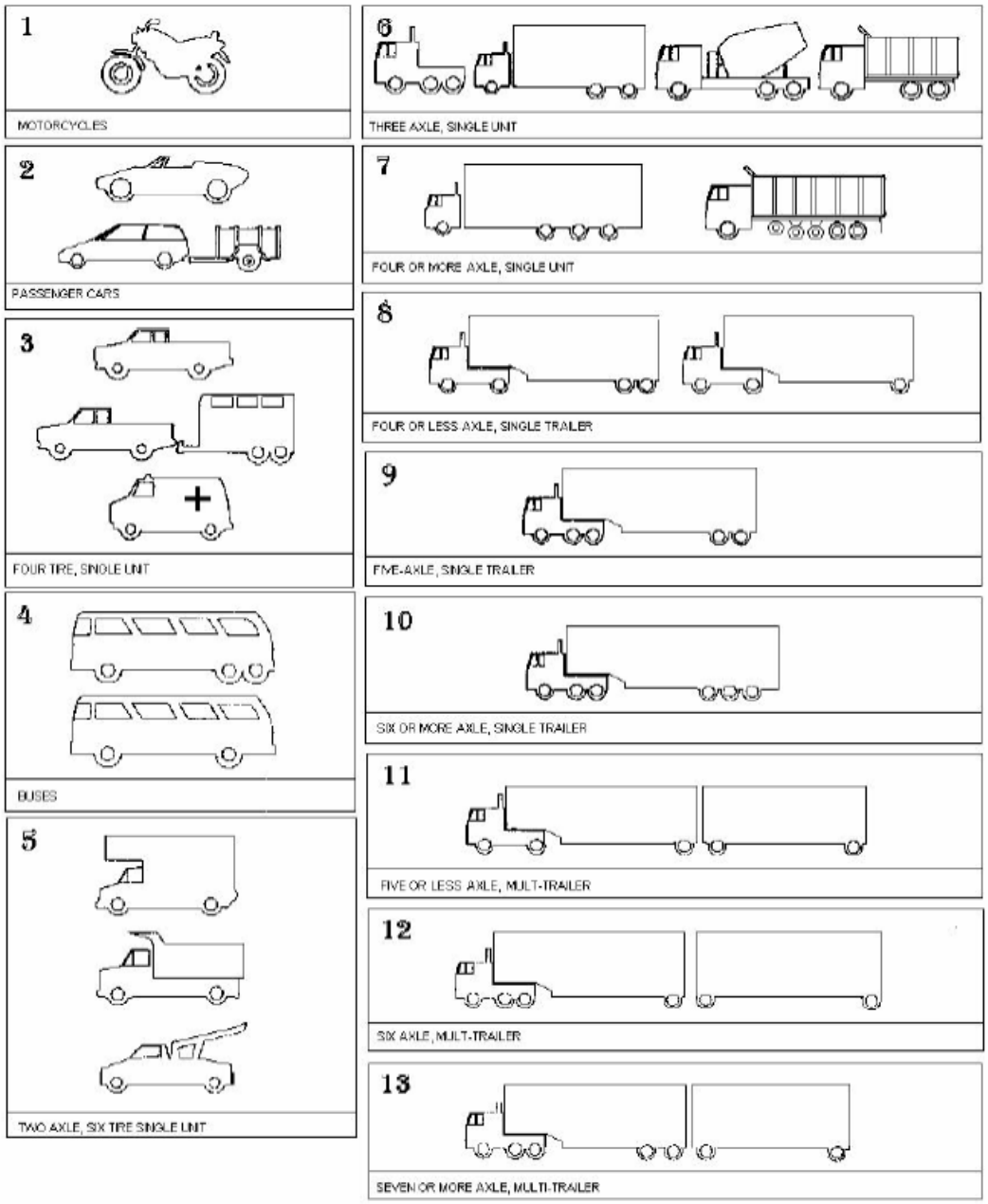
APPENDIX A: FHWA VEHICLE CLASSIFICATION SCHEME (USDOT 2001)

The FHWA Classification scheme is divided into categories based on whether the vehicle carries passengers or commodities. Commodity carriers (Non-passenger vehicles) are further subdivided by number of axles and number of units, including both power and trailer units. Note that the addition of a light trailer to a vehicle does not change the classification of the vehicle. A pictorial representation of the classification scheme is given below:



Vehicle Class Definitions

Class 1- **Motorcycles:** All two- or three-wheeled motorized vehicles. Typical vehicles in this category have saddle type seats and are steered by handle bars rather than wheels. This category includes motorcycles, motor scooters, mopeds, motor-powered bicycles, and three-wheeled motorcycles.

Class 2- **Passenger Cars:** All sedans, coupes, and station wagons manufactured primarily for the purpose of carrying passengers and including those passenger cars pulling recreational or other light trailers.

Class 3- **Other Two-Axle, Four-Tire, Single-Unit Vehicles:** All two-axle, four-tire vehicles other than passenger cars. Included in this classification are pickups, panels, vans, and other vehicles such as campers, motor homes, ambulances, hearses, carryalls, and minibuses. Other two-axle, four-tire single unit vehicles pulling recreational or other light trailers are included in this classification.

Class 4- **Buses:** All vehicles manufactured as traditional passenger-carrying buses with two axles and six tires or three or more axles. This category includes only traditional buses (including school buses) functioning as passenger-carrying vehicles. Modified buses should be considered to be trucks and be appropriately classified.

Note: In reporting information on trucks the following criteria should be used:

a. Truck tractor units traveling without a trailer will be considered single-unit trucks.

b. A truck tractor unit pulling other such units in a “saddle mount” configuration will be considered as one single-unit truck and will be defined only by axles on the pulling unit.

c. Vehicles shall be defined by the number of axles in contact with the roadway. Therefore, “floating” axles are counted only when in the down position.

d. The term “trailer” includes both semi- and full trailers.

Class 5- **Two-Axle, Six-Tire, Singl-Unit Trucks:** All vehicles on a single frame, including trucks, camping and recreational vehicles, motor homes, etc., having two axles and dual rear wheels.

Class 6- **Three-axle Single-Unit Trucks:** All vehicles on a single frame, including trucks, camping and recreational vehicles, motor homes, etc., having three axles.

Class 7- **Four- or More Axle Single-Unit Trucks:** All trucks on a single frame with four or more axles.

Class 8- **Four- or Less Axle Single-Trailer Trucks:** All vehicles with four or less axles consisting of two units, one of which is a tractor or straight truck power unit.

Class 9- **Five-Axle Single-Trailer Trucks:** All five-axle vehicles consisting of two units, one of which is a tractor or straight truck power unit.

Class 10- **Six- or More Axle Single-Trailer Trucks:** All vehicles with six or more axles consisting of two units, one of which is a tractor or straight truck power unit.

Class 11- **Five- or Less Axle Multi-Trailer Trucks:** All vehicles with five or less axles consisting of three or more units, one of which is a tractor or straight truck power unit.

Class 12- **Six-Axle Multi-Trailer Trucks:** All six-axle vehicles consisting of three or more units, one of which is a tractor or straight truck power unit.

Class 13- **Seven- or More Axle Multi-Trailer Trucks:** All vehicles with seven or more axles consisting of three or more units, one of which is a tractor or straight truck power unit.

APPENDIX B: SUMMARY OF RESPONSE FROM DOTS

State	Response to Questionnaire	Additional Information Received
California	Yes	-
Illinois	Yes	-
Indiana	No	-
Iowa	Yes	Iowa DOT Traffic Monitoring Program Manual
Kansas	Yes	Traffic Counting & Adjustment Procedures Document
Minnesota	Yes	MN DOT Procedure Manual for Forecasting Traffic on Minnesota's Highway Systems
Missouri	Yes	-
Nebraska	Yes	-
South Dakota	Yes	SD DOT Traffic Monitoring Manual
Wisconsin	Yes	-
Florida	Yes	Project Traffic Forecasting Handbook

APPENDIX C: RAW DATA FROM COUNT STATION 201

```
000000002010 000000002010 01 0000 050101 2400 050101 0060 04 2 100  54  300
0000 0000 0000 0000 0000 0000 0000 0000 0000 02XXXXXX 'iowa2___
'HAMPTON       '35         'US 65 4.3 KM N OF IA 3
06 03    0022 0036 0215
01 02    0001 0002
00 00
01 01 0 0100 0000 0002 0000
01 02 2 0100 0005 0000 0001
01 01 0 0200 0000 0006 0000
01 02 2 0200 0006 0001 0002
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01 01 0 0500 0000 0006 0000
01 02 2 0500 0011 0002 0002
01 01 0 0600 0000 0035 0000
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01 01 0 0700 0000 0078 0000
01 02 2 0700 0053 0002 0008
01 01 0 0800 0000 0079 0000
01 02 2 0800 0070 0001 0006
01 01 0 0900 0000 0067 0000
01 02 2 0900 0059 0005 0008
01 01 0 1000 0000 0077 0000
01 02 2 1000 0041 0006 0006
01 01 0 1100 0000 0078 0000
01 02 2 1100 0055 0002 0009
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01 02 2 1200 0055 0004 0008
01 01 0 1300 0000 0078 0000
01 02 2 1300 0065 0005 0011
01 01 0 1400 0000 0080 0000
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01 02 2 1500 0051 0007 0008
01 01 0 1600 0000 0107 0000
01 02 2 1600 0087 0007 0009
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01 02 2 1700 0108 0005 0008
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01 02 2 1800 0095 0005 0003
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01 02 2 2300 0011 0000 0003
01 01 0 2400 0000 0014 0000
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```
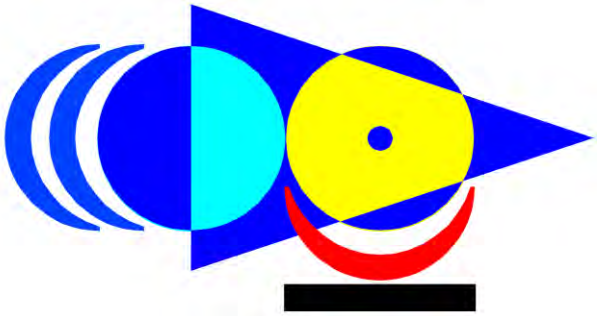

Attachment #8: Project Traffic Forecasting Handbook

2014

Project Traffic Forecasting Handbook

METHODS RELEVANT TO TRUCK TRAFFIC ESTIMATES ARE SELECTED



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CHAPTER THREE – FORECASTING with TRAVEL DEMAND MODELS

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CHAPTER ONE

INTRODUCTION AND OVERVIEW

1.1 PURPOSE

This handbook offers guidelines and techniques on the **Project Traffic Forecasting Process** for use by FDOT staff and consultants providing traffic parameters required by project design. This handbook may be used by local governments and other agencies to review highway projects. This handbook provides instructions for **Corridor Traffic Forecasting, Project Traffic Forecasting and Equivalent Single Axle Loading (ESAL) Forecasting**.

1.2 INTRODUCTION

This handbook supplements the **Project Traffic Forecasting Procedure Topic No. 525-030-120** and consists of seven Chapters with three Appendices:

Chapter 1 Introduction and Overview

This chapter describes general guidelines, references, definitions, and techniques to be used in the Project Traffic Forecasting Process. In addition, it also outlines the forecasting processes which include Corridor, Project and Equivalent Single Axle Load (ESAL).

Chapter 2 Traffic Data Sources and Factors

This chapter describes the different types of traffic counters in operation, the current traffic data collection methodologies used in the State of Florida, the estimation and tabulation of Seasonal Factors (SF), axle correction factors (ACF), estimates of Annual Average Daily Traffic (AADT), K and Standardized K, Directional Design Volume Factor (D), and Percent Trucks (T) for the current year.

Chapter 3 Forecasting with Travel Demand Models

This chapter provides guidance in the application of models to develop traffic projections for route specific (PD&E) studies, corridor studies and resurfacing type projects. This chapter also provides an overview of modeling for traffic engineers and an overview of traffic forecasting requirements for modelers.

Chapter 4 Forecasting without a Traffic Model

This chapter provides a description of the appropriate methods of performing trend analysis and examination of local land use plans, and other indicators of future growth in the project traffic forecasting process.

Chapter 5 Directional Design Hourly Volumes

This chapter describes the appropriate methods for converting model volume outputs to Annual Average Daily Traffic (AADT) volumes and then into Directional Design Hourly Volumes (DDHVs), which are used in the evaluation of roadway points, links and facility analyses.

Chapter 6 Estimating Intersection Turning Movements

The purpose of this chapter is to provide a method for balancing turning movement volumes at intersections. The TURNS5-V2014 spreadsheet is explained and reviews of other techniques are summarized.

Chapter 7 Equivalent Single Axle Load Forecast

This chapter describes the guidelines and techniques of forecasting Equivalent Single Axle Load (ESAL) volumes for use in pavement design.

Appendix A

Central Office and District Planning and Modeling Contacts

Appendix B

FHWA Letter - Use of Standard K-Factors for Traffic Forecasting

Appendix C

Example - District Two Manual Method–Balancing Turning Movement Volumes

1.3 AUTHORITY

Sections 20.23(4)(a) and 334.048(3); Florida Statutes (F.S.).

1.4 REFERENCES

Sections 334.03(25); 334.046(1) and (2); 334.063; 334.17; 334.24; and 338.001(5); (F.S.).

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1.4 REFERENCES - continued

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National Cooperative Highway Research Program (NCHRP) Report 277, "Portland Cement Concrete Pavement Evaluation System (COPES)**"**, M. L. Darter, J. M. Becker, M. B. Snyder and R. E. Smith, Transportation Research Board (TRB), September 1985.

FDOT uses the latest version of each reference listed. These documents can be obtained from the Office of Maps and Publications, (850) 414-4050 or through DOT INFONET under Maps and Publications Internet and Forms and Procedures Intranet.

1.5 GLOSSARY

Terms in this handbook are used as defined in the most recent editions of the **Highway Capacity Manual** (HCM 2010), **A Policy on Geometric Design of Highways and Streets** (AASHTO), and the **Project Traffic Forecasting Procedure**. Modeling terms which are used in Travel Demand Forecasting Models (Chapter 3) are followed by (MODEL). The following terms are defined to reflect their meaning in this **Project Traffic Forecasting Handbook**:

ACTION PLAN — A document identifying low cost, short-term, and major capacity improvements necessary to bring a controlled access facility to Strategic Intermodal System/Florida Intrastate Highway System (SIS/FIHS) standards within 20 years.

ADJUSTED COUNT — An estimate of a traffic statistic calculated from a base traffic count that has been adjusted by application of axle, seasonal, or other defined factors. (AASHTO)

AADT

ANNUAL AVERAGE DAILY TRAFFIC — The total volume of traffic on a highway segment for one year, divided by the number of days in the year. This volume is usually estimated by adjusting a short-term traffic count with weekly and monthly factors. (AASHTO)

AAWDT **ANNUAL AVERAGE WEEKDAY TRAFFIC** — The estimate of typical traffic during a weekday (Monday through Friday) calculated from data measured at continuous traffic monitoring sites.

AREA OF INFLUENCE — The geographical transportation network of state and regionally significant roadway segments on which the proposed project would impact five percent or more of the adopted peak hour level of service maximum service volume of the roadway, and the roadway is, or is projected to be, operating below the adopted level of service standard in the future.

ARTERIAL — A signalized roadway that serves primarily through-traffic and provides access to abutting properties as a secondary function, having signal spacings of two miles or less and turning movements at intersections that usually does not exceed 20 percent (%) of the total traffic.

ADT **AVERAGE DAILY TRAFFIC** — The total traffic volume during a given time period (more than a day and less than a year) divided by the number of days in that time period. (AASHTO)

1.5 GLOSSARY - continued

ACF

AXLE CORRECTION FACTOR — The factor developed to adjust vehicle axle sensor base data for the incidence of vehicles with more than two axles, or the estimate of total axles based on automatic vehicle classification data divided by the total number of vehicles counted. (AASHTO)

BASE COUNT — A traffic count that has not been adjusted for axle factors (effects of trucks) or seasonal (day of the week/month of the year) effects. (AASHTO)

BASE DATA — The unedited and unadjusted measurements of traffic volume, vehicle classification, and vehicle or axle weight. (AASHTO)

BASE YEAR — The initial year of the forecast period.

BASE YEAR (MODEL) — The year the modeling system was calibrated, from which projections are made.

CALIBRATION (MODEL) — An extensive analysis of a travel demand forecasting model based on census, survey, traffic count and other information.

CAPACITY — The maximum sustainable hourly flow rate at which persons or vehicles can be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, environmental, traffic and control conditions. (HCM 2010)

CORE FREEWAY — A conceptual term defining a freeway (major, through, non-toll) routed into or through a large urbanized area's core area (central business districts). The Standard K value may change on this Core Freeway as it passes through the urbanized area. (FDOT)

CORRIDOR — A broad geographical band that follows a general directional flow connecting major origins and destinations of trips and that may contain a number of alternate transportation alignments.

CORRIDOR TRAFFIC FORECASTING — The process used to determine the required number of lanes within a corridor to meet anticipated traffic demands.

1.5 GLOSSARY - continued

CORRIDOR TRAFFIC STUDY — The long range system data forecast that includes projected link volumes and other data necessary to determine the number of lanes needed on a particular roadway and that includes the analysis of transportation alternatives for the corridor.

COUNT — The data collected as a result of measuring and recording traffic characteristics such as vehicle volume, classification, speed, weight, or a combination of these characteristics. (AASHTO)

COUNTER —-Any device that collects traffic characteristics data. FDOT utilizes Continuous Counters, Continuous Classification and Weigh-In-Motion (WIM) Counters, Portable Axle Counters, and Portable Vehicle Counters. (*see* TTMS, PTMS)

CUTLINE — A cutline is similar to a screenline; however, it is shorter and crosses corridors rather than regional flows. Cutlines should be established to intercept travel along only one axis. (MODEL)

DTV **DAILY TRUCK VOLUME** — The total volume of trucks on a highway segment in a day.

DAMAGE FACTOR — (*see* Load Equivalency Factor).

DEMAND VOLUME — The traffic volume expected to desire service past a point or segment of the highway system at some future time, or the traffic currently arriving or desiring service past such a point, usually expressed as vehicles per hour.

DESIGN HOUR — An hour with a traffic volume that represents a reasonable value for designing the geometric and control elements of a facility. (HCM 2010)

DESIGN HOUR FACTOR — The proportion of the AADT that occurs during the design hour. (*see* also K-FACTOR) (HCM 2010)

DHT **DESIGN HOUR TRUCK** — The percent of trucks expected to use a highway segment during the design hour of the design year. The adjusted, annual design hour percentage of trucks and buses (24T+B).

1.5 GLOSSARY - continued

DHV **DESIGN HOUR VOLUME** — The traffic volume expected to use a highway segment during the design hour of the design year. The Design Hour Volume (DHV) is related to AADT by the "K" factor.

DH2 — The adjusted, annual design hour medium truck percentage. The sum of the annual percentages of Class Groups 4 and 5 (*see* Figure 2.2), adjusted to 24 hours.

DH3 — The adjusted, annual design hour heavy truck percentage. Is DHT minus DH2, or the sum of the adjusted annual percentages of Class Groups 6 through 13 (*see* Figure 2.2).

DESIGN PERIOD — The number of years from the initial application of traffic until the first planned major resurfacing or overlay. (AASHTO)

DESIGN YEAR —- Usually 20 years from the Opening Year, but may be any time within a range of years from the present (for restoration type projects) to 20 years in the future (for new construction type projects). The year for which the roadway is designed.

DRI **DEVELOPMENT OF REGIONAL IMPACT** — Any development which, because of its character, magnitude, or location, would have a substantial effect upon the health, safety, or welfare of citizens of more than one county.
(F.S. 1993 LAND AND WATER MANAGEMENT)

DDHV **DIRECTIONAL DESIGN HOUR VOLUME** — The traffic volume expected to use a highway segment during the design hour of the design year in the peak direction.

1.5 GLOSSARY - continued

D **DIRECTIONAL DISTRIBUTION** — The percentage of total, two-way peak hour traffic that occurs in the peak direction.

D — The proportion of traffic based on the median (average) for the design hour of the design year traveling in the peak direction. D is often used in calculating the level of service for a roadway.

DF — Directional distribution factor for $ESAL_D$ equation. Use 1.0 if one-way traffic is counted or 0.5 for two-way. This value is not to be confused with the Directional Factor (D) used for planning capacity computations.

ESAL **EQUIVALENT SINGLE AXLE LOAD** — A unit of measurement equating the amount of pavement consumption caused by an axle or group of axles, based on the loaded weight of the axle group, to the consumption caused by a single axle weighing 18,000 lbs. (AASHTO)

ESAL FORECASTING PROCESS — The process required to estimate the cumulative number of 18-KIP ESALs for the design period; used to develop the structural design of the roadway.

FACTOR — A number that represents a ratio of one number to another number. The factors used in this handbook are K, D, T, Design Hour Factor, Peak Hour Factor and Seasonal Factor. The Load Equivalency Factor adjusts pavement damage calculations.

FDOT **FLORIDA DEPARTMENT OF TRANSPORTATION**

FHWA **FEDERAL HIGHWAY ADMINISTRATION**

FIHS **FLORIDA INTRASTATE HIGHWAY SYSTEM** — A system of existing and future limited access and controlled access facilities that have the capacity to provide high-speed and high-volume traffic movements in an efficient and safe manner.

FM **FINANCIAL MANAGEMENT SYSTEM**

FPI **FINANCIAL PROJECT IDENTIFIER**

1.5 GLOSSARY - continued

FSUTMS **FLORIDA STANDARD URBAN TRANSPORTATION MODEL STRUCTURE** — The standard model for projecting traffic flow in the State of Florida.

FTP **FLORIDA TRANSPORTATION PLAN** — A statewide, comprehensive transportation plan, to be annually updated, which is designed to establish long range goals to be accomplished over a 20-25 year period and to define the relationships between the long range goals and short range objectives and policies implemented through the Work Program.

FORECAST PERIOD — The total length of time covered by the traffic forecast. It is equal to the period from the base year to the design year. For existing roads, the forecast period will extend from the year in which the forecast is made, and thus must include the period prior to the project being completed as well as the life of the project improvement.

FREEWAY — A fully access-controlled, divided highway with a minimum of two lanes (and frequently more) in each direction. (HCM 2010)

HIGHWAY — A term that includes roads, streets, and parkways and all appurtenances.

HCM **HIGHWAY CAPACITY MANUAL**

HOV **HIGH OCCUPANCY VEHICLE** —Any vehicle carrying two or more passengers.

IJR **INTERCHANGE JUSTIFICATION REPORT** — The documentation submitted through FDOT to FHWA to determine if a new interchange on an interstate is allowed.

IMR **INTERCHANGE MODIFICATION REPORT** — The documentation submitted through FDOT to FHWA to determine if modification to an existing interchange on an interstate is allowed.

INTERMEDIATE YEAR — Any future year in the forecast period between the base year and the design year, typically halfway between the opening year and the design year.

1.5 GLOSSARY - continued

K-FACTOR— The ratio of the traffic volume in the study hour to the Annual Average Daily Traffic (AADT). (*see also* **Standard K**)

L_f **LANE FACTOR** — Value calculated by a formula that accounts for the proportion of vehicles that use the design lane (commonly the outside lane) of a divided roadway. The percentage of vehicles driving in the design lane is dependent on the directional number of lanes, and the AADT. Lane Factor is used to convert directional trucks to the design lane trucks. Lane factors can be adjusted to account for unique features known to the designer such as roadways with designated truck lanes.

See COPES equation: (Section 7.4.3)

$L_F = (1.567 - 0.0826 \times \text{Ln}(\text{One-Way AADT}) - 0.12368 \times LV)$

LOS **LEVEL OF SERVICE** — A quantitative stratification of a performance measure or measures that represent quality of service, measured on an A-F scale, with LOS A representating the best operating conditions from the traveler's perspective and LOS F the worst. (HCM 2010)

LINK — The spatial representation of the transportation system, which may or may not constitute a one-to-one correspondence to the actual major components of the transportation system being modeled. There are three primary attributes which describe a link: facility type, area type, and the number of lanes. (MODEL)

LOAD EQUIVALENCY FACTOR — The ratio of the number of repetitions of an 18,000 pound single axle load necessary to cause the same degree of pavement damage as one application of any axle load and axle number combination. A Load Equivalency Factor is commonly referred to as a damage factor.

LGCP **LOCAL GOVERNMENT COMPREHENSIVE PLAN** — The plan (and amendments thereto) developed and approved by the local governmental entity pursuant to Chapter 163, F.S., and Rule Chapter 9J-5, Florida Administrative Code, and found in compliance by the Florida Department of Community Affairs.

1.5 GLOSSARY - continued

LONG RANGE PLAN — A document with a 20-year planning horizon required of each Metropolitan Planning Organization (MPO) that forms the basis for the annual Transportation Improvement Program (TIP), developed pursuant to Title 23 United States Code 134 and Title 23 Code of Federal Regulations Part 450 Subpart C.

MASTER PLAN — A document identifying both short-term and long-term capacity improvements to limited access highways (Interstate, Turnpike and other expressways) consistent with policies and standards to meet SIS/FIHS standards. Master Plans shall also identify potential new or modifications to existing interchanges.

MPO **METROPOLITAN PLANNING ORGANIZATION**

MOCF **MODEL OUTPUT CONVERSION FACTOR** — The MOCF is used to convert the traffic volumes generated by a travel demand forecasting model (PSWADT) to AADT. The MOCF is the average of the 13 consecutive weeks during which the highest weekday volumes occur and when the sum of Seasonal Factors (SF) for those 13 weeks are the lowest. MOCF used in validation to convert AADT to PSWADT for the base year model network should be used for adjusting future year model volume. Note: Currently, there are several model outputs throughout the State that require conversion from PSWADT to AADT using MOCF (see page 3-80).

MADT **MONTHLY AVERAGE DAILY TRAFFIC** — The estimate of mean traffic volume for a month, calculated by the sum of Monthly Average Days of the Week (MADWs) divided by seven; or in the absence of a MADW for each day of the week, divided by the number of available MADWs during the month. (AASHTO)

MADW **MONTHLY AVERAGE DAYS OF THE WEEK** — The estimate of traffic volume mean statistic for each day of the week, over the period of one month. It is calculated from edited-accepted permanent data as the sum of all traffic for each day of the week (Sunday, Monday, and so forth through the week) during a month, divided by the occurrences of that day during the month. (AASHTO)

1.5 GLOSSARY - continued

MSF **MONTHLY SEASONAL FACTOR** — A seasonal adjustment factor derived by dividing the AADT by the MADT for a specific TTMS count site.

OPENING YEAR — One year beyond the scheduled beginning of construction as defined in the Adopted Five Year Work Program for a project. This is normally provided by the project manager.

PD&E **PROJECT DEVELOPMENT & ENVIRONMENT/ENVIRONMENTAL**

PHF **PEAK HOUR FACTOR** — The hourly volume during the analysis hour divided by the peak 15-min flow rate within the analysis hour; a measure of traffic demand fluctuation within the analysis hour. (HCM 2010)

PEAK HOUR-PEAK DIRECTION — The direction of travel (during the 60-minute peak hour) that contains the highest percentage of travel.

PEAK SEASON — The 13 consecutive weeks of the year with the highest traffic volume.

PSCF **PEAK SEASON CONVERSION FACTOR** — Used to convert a 24-hour count representing the average weekday daily traffic to PSWADT.

PSWADT **PEAK SEASON WEEKDAY AVERAGE DAILY TRAFFIC** — The average weekday traffic during the peak season. FSUTMS traffic assignment volume represents Peak Season Weekday Average Daily Traffic (PSWADT) projections for the roads represented in the model highway network. For Project Traffic Forecasting Reports, the PSWADT should be converted to AADT using a MOCF. Note: Currently, there are several model outputs throughout the State that require conversion from PSWADT to AADT using MOCF.

p/d **PEAK-TO-DAILY RATIO** — The highest hourly volume of a day divided by the daily volume.

PERMANENT COUNT — A 24-hour traffic count continuously recorded at a permanent count station.

1.5 GLOSSARY - continued

PERMANENT COUNT STATION — Automatic Traffic Recorders that are permanently placed at specific locations throughout the state to record the distribution and variation of traffic flow by hours of the day, days of the week, and months of the year from year to year. (*see* TTMS — Telemetered Traffic Monitoring Site)

PTMS **PORTABLE TRAFFIC MONITORING SITE** — Automatic Traffic Recorders that are temporarily placed at specific locations throughout the state to record the distribution and variation of traffic flow.

PROJECT TRAFFIC — A forecast of the design hour traffic volume for the design year. Project Traffic Forecasting projections are required by FDOT for all design projects.

PROJECT TRAFFIC FORECASTING (PTF) — The process to estimate traffic conditions used for determining the geometric design of a roadway and/or intersection and the number of 18-KIP ESALs that pavement will be subjected to over the design life.

RCI **ROADWAY CHARACTERISTICS INVENTORY** — A database maintained by the Transportation Statistics Office (TranStat) which contains roadway and traffic characteristics data for the State Highway System, including current year traffic count information such as AADT and the traffic adjustment factors, K, D, and T.

SCREENLINE — An imaginary line which intercepts major traffic flows through a region, usually along a physical barrier such as a river or railroad tracks, splitting the study area into parts. Traffic counts and possibly interviews are conducted along this line as a means to compare simulated model results to field results as part of the calibration/validation of a model. (MODEL)

SF **SEASONAL FACTOR** — Parameters used to adjust base counts which consider travel behavior fluctuations by day of the week and month of the year. The Seasonal Factor used in Florida is determined by interpolating between the Monthly Seasonal Factors for two consecutive months. (AASHTO)

1.5 GLOSSARY - continued

SERVICE FLOW RATE — The maximum directional rate of flow that can be sustained in a given segment under prevailing roadway, traffic, and control conditions without violating the criteria for LOS*i*. (HCM 2010)

STANDARD K — A conceptual "design" term defining factors within a rural, transitioning, urban or urbanized area that are based on a ratio of peak hour volume to annual average daily traffic (K). Multiple standard K factors may be assigned depending on the area type and facility type and applied statewide.

SIS — **STRATEGIC INTERMODAL SYSTEM** — Facilities, including appropriate components of all modes, and services of statewide or interregional significance that meet high levels of people and goods movement, generally supporting the major flows of interregional, interstate, and international trips. Both "Strategic Intermodal System" and "Emerging SIS" are a formal part of "The SIS".

TARGET YEAR — The final year of the forecast period; i.e., the design year, or the future year for which roadway improvements are designed.

T_f — **T-FACTOR** — Truck Factor; the percentage of truck traffic during the peak hours.

T_{24} — The percentage of truck traffic for 24 hours (one day). (Categories 4-13, see Figure 2.2)

24T+B — **24-HOUR TRUCK + BUS** PERCENTAGE — The adjusted, annual 24-hour percentage of trucks and buses (Categories 4 through 13, *see* Figure 2.2).

24T — **24-HOUR TRUCK PERCENTAGE** — The adjusted, annual 24-hour percentage of trucks (Categories 5 through 13, *see* Figure 2.2).

TAZ — **TRAFFIC ANALYSIS ZONE** — The basic unit of analysis representing the spatial aggregation for people within an urbanized area. Each TAZ may have a series of zonal characteristics associated with it which are used to explain travel flows among zones. Typical characteristics include the number of households and the number of people that work and/or live in a particular area. (MODEL)

1.5 GLOSSARY - continued

TRAFFIC BREAK — A continuous section of highway that is reasonably homogenous with respect to traffic volume, vehicle classification, and general physical characteristics (e.g., number of through lanes), with beginning and ending points at major intersections or interchanges. Traffic breaks are determined through engineering judgment by the Districts and are recorded in the Roadway Characteristics Inventory (RCI).

TCI **TRAFFIC CHARACTERISTICS INVENTORY** — A database maintained by TranStat which contains both historical and current year traffic count information including AADT and the traffic adjustment factors, K, D, and T.

TPO **TRANSPORTATION PLANNING ORGANIZATION**

TRAFFIC VOLUME COUNT — Any short-term count taken by a portable axle counter on a roadway.

TranStat **TRANSPORTATION STATISTICS OFFICE** — The FDOT Central Office in Tallahassee that monitors and reports statistical traffic information for the State Highway System.

TTMS **TELEMETERED TRAFFIC MONITORING SITE** — Automatic Traffic Recorders that are permanently placed at specific locations throughout the state to record the distribution and variation of traffic flow by hour of the day, day of the week, and month of the year, from year to year, and transmit the data to the TranStat Office via wireless communication.

TRUCK — Any heavy vehicle described in FHWA Classification Scheme F (*see* Figure 2.2), Classes 4-13; i.e., buses and trucks with six or more tires. Class 14 is available for state definition of a special truck configuration not recognized by Scheme F. At the present time, only Classes 1-13 (Classes 1-3 are motorcycles, automobiles, and light trucks) are used in Florida.

VALIDATION (MODEL) — An analysis of a travel demand forecasting model based on traffic count and other information. A validation is usually less extensive than a calibration.

1.5 GLOSSARY - continued

VHT **VEHICLE HOURS OF TRAVEL** — A statistic representing the total number of vehicles multiplied by the total number of hours that vehicles are traveling. The VHT is most commonly used to compare alternative transportation systems. In general, if alternative "A" reflects a VHT of 150,000 and alternative "B" reflects a VHT of 200,000 it can be concluded that alternative "A" is better in that drivers are getting to their destinations quicker. (MODEL)

VMT **VEHICLE MILES OF TRAVEL** — A statistic representing the total number of vehicles multiplied by the total number of miles which are traversed by those vehicles. The VMT is used on a region-wide basis as a measure of effectiveness to compare system performance to other urbanized areas. (MODEL)

v/c **VOLUME TO CAPACITY RATIO** — Either the ratio of demand volume to capacity or the ratio of service flow volume to capacity, depending on the particular problem situation. This is one of the six factors used to determine the level of service.

WIM **WEIGH-IN-MOTION** — The process of estimating a moving vehicle's static gross weight and the portion of that weight that is carried by each wheel, axle, or axle group or combination thereof, by measurement and analysis of dynamic forces applied by its tires to a measuring device. (AASHTO)

WPA **WORK PROGRAM** — The five-year listing of all transportation projects planned for each fiscal year by FDOT, as adjusted for the legislatively approved budget for the first year of the program.

WPI **WORK PROGRAM ITEM** (First 6-digits of FPI)

1.6 BACKGROUND

Project Traffic Forecasting estimates are needed for Planning and Project Development and Environmental (PD&E) studies and construction plans which lead to construction, traffic improvements, and pavement design projects. A Project Traffic Report is routinely developed as part of most Project Development and Environmental Studies. Primary components of the report are supporting documentation related to the Project Traffic Forecasting Process and highway capacity and level of service (LOS) analyses.

FDOT's Roadway Plans Preparation Manual requires Project Traffic and its major parameters to be posted on the Typical Section sheets. This handbook supplements the information described in the Project Traffic Forecasting Procedure, Topic No. 525-030-120.

The Project Traffic Forecasting Procedure describes in detail the three forecasting processes which include Corridor, Project and Equivalent Single Axle Load (ESAL). Figure 1.1 outlines the relationship between Corridor Traffic Forecasting, Project Traffic Forecasting, and ESAL processes.

Corridor projects usually require the development of travel projections which are used to make decisions which have important capacity and capital investment implications. The traffic forecasting is required before establishing a new alignment or widening of an existing facility. The Corridor Traffic Forecasting Process is further detailed in Chapter 3 of this handbook.

The Project Traffic projections are commonly used to develop laneage requirements for intersection designs, and to evaluate the operational efficiency of proposed improvements. Project Traffic Forecasting is also required for reconstruction, resurfacing, adding lanes, bridge replacement, new roadway projects, and major intersection improvements. This process differs from Corridor Traffic Forecasting in that it is site specific and covers a limited geographic area. Further details may also be found in Chapter 3 of this handbook.

The Equivalent Single Axle Loading (ESAL) Forecasting Process is necessary for pavement design for new construction, reconstruction, or resurfacing projects. Truck traffic and damage factors are needed to calculate axle loads expressed as ESALs. The ESAL Forecasting Process is detailed in Chapter 8 of this handbook.

The four major types of construction projects are Preservation (resurfacing), Intersection Operational Improvements (add turns lanes), Roadway Capacity Improvements (add through lanes) and New Alignment Projects. Traffic operations projects such as signal

timing, signal phasing and other non-construction type projects are not covered under this procedure.

Construction projects require both the Project Traffic Forecasting Process and the Equivalent Single Axle Load (ESAL) Process to be performed. Preservation Projects, which are usually resurfacing projects, only require the ESAL process to determine the appropriate Load Equivalency Factor for the pavement to be laid. Traffic Operation Improvements, such as improving shoulders or turn lanes and restriping roads are not covered under this procedure.

Corridor Traffic Forecasting and Project Traffic Forecasting projects require forecasts of Annual Average Daily Traffic (AADT) and Design Hour Volumes (DHV). AADT and DHV are related to each other by the ratio commonly known as the K-factor.

The overall truck volume and AADT are related to each other by the T-factor. The total impact of truck traffic on pavement design is expressed in units of ESALs, which represent truck axle weights converted into 18,000 pound (18-KIP) loads carried by a single, four-tire axle. The metric equivalent is 80,000 newtons .

FHWA CLASSIFICATION SCHEME "F"

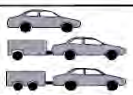
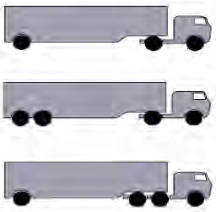
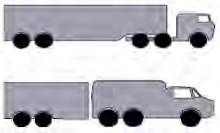
CLASS GROUP		DESCRIPTION	NO. OF AXLES
1		MOTORCYCLES	2
2		ALL CARS CARS W/ 1-AXLE TRAILER CARS W/ 2-AXLE TRAILER	2 3 4
3		PICK-UPS & VANS 1 & 2 AXLE TRAILERS	2, 3, & 4
4		BUSES	2 & 3
5		2-AXLE, SINGLE UNIT	2
6		3-AXLE, SINGLE UNIT	3
7		4-AXLE, SINGLE UNIT	4
8		2-AXLE, TRACTOR, 1-AXLE TRAILER (2S1) 2-AXLE, TRACTOR, 2-AXLE TRAILER (2S2) 3-AXLE, TRACTOR, 1-AXLE TRAILER (3S1)	3 4 4
9		3-AXLE, TRACTOR, 2-AXLE TRAILER (3S2) 3-AXLE, TRUCK, W/ 2-AXLE TRAILER	5 5
10		TRACTOR W/ SINGLE TRAILER	6 & 7
11		5-AXLE MULTI-TRAILER	5
12		6-AXLE MULTI-TRAILER	6
13	ANY 7 OR MORE AXLE		7 or more
14	NOT USED		
15	UNKNOWN VEHICLE TYPE		

Figure 2.2 FHWA Vehicle Classification Scheme "F"

2.4 SHORT-TERM TRAFFIC COUNTS

These counts are primarily performed by the Districts, local agencies and consultants who are responsible for reporting counts using various portable traffic counting devices. These counts are collected using axle counters and/or vehicle counters.

Portable traffic counters frequently use rubber hoses that record by sensing the number of axles. These counters are small enough to be transported, contain a power source, internal clock, and may be easily secured to a telephone pole, fence post, sign post, tree, etc. All counters utilize electronic storage and require special software and/or hardware to download the collected data. The downloaded data can be transferred directly to a computer or may be printed in a report format. Another type of portable unit adheres to the road surface in the middle of a lane and uses magnetic vehicle detectors rather than axle sensors and records bumper to bumper length and speed in a variety of length and speed groups. The unit requires a special computer to download the data. Other technologies are continually being developed and tested.

2.4.1 Portable Axle Counters

Portable Axle counters are those that have a single rubber hose to sense axles. These counters simply divide the number of axles by two to derive a count. If the counting device measures the "number of axles," an axle correction factor is assigned to the specific count location based on the trucking characteristics of that location. The axle correction factor is applied to the count and then the count is seasonally adjusted to produce AADT.

2.4.2 Portable Vehicle Counters

Examples of Portable Vehicle counters include microwave, magnetic, video, inductive loops, and vehicle classifiers. If the counting device counts the "number of vehicles," the count site will not require an axle correction factor.

2.4.3 Seasonal Adjustments

All short-term counts must be adjusted to reflect the seasonal changes in traffic volumes. TranStat determines the Seasonal Factor Category using traffic data collected from permanent count locations. The Districts assign a Seasonal Factor Category to each short-term traffic count site. The basic assumption is that seasonal variability and traffic characteristics of short-term and permanent counts are similar.

2.5 TRAFFIC ADJUSTMENT FACTORS

The two traffic adjustment factors, Seasonal and Axle Correction, are calculated by the TranStat Office and can be accessed through either the **Traffic Characteristics Inventory (TCI)** database or the **Florida Traffic Online (FTO)** application. Both TCI and FTO contain current and historical information. The continuous counts and the seasonal classification counts provide the necessary information to establish traffic adjustment factors. In the absence of any continuous counts within a county, TranStat borrows seasonal factors from adjacent counties and develops seasonal factors for those counties. These adjustment factors are later applied to the short-term counts to estimate AADT, K, D, and T.

2.5.1 Seasonal Factor (SF)

The Monthly Seasonal Factor (MSF) for a particular month in a particular location is derived from the Annual Average Daily Traffic (AADT) for a location divided by the Monthly Average Daily Traffic (MADT) for a specific month at that count site:

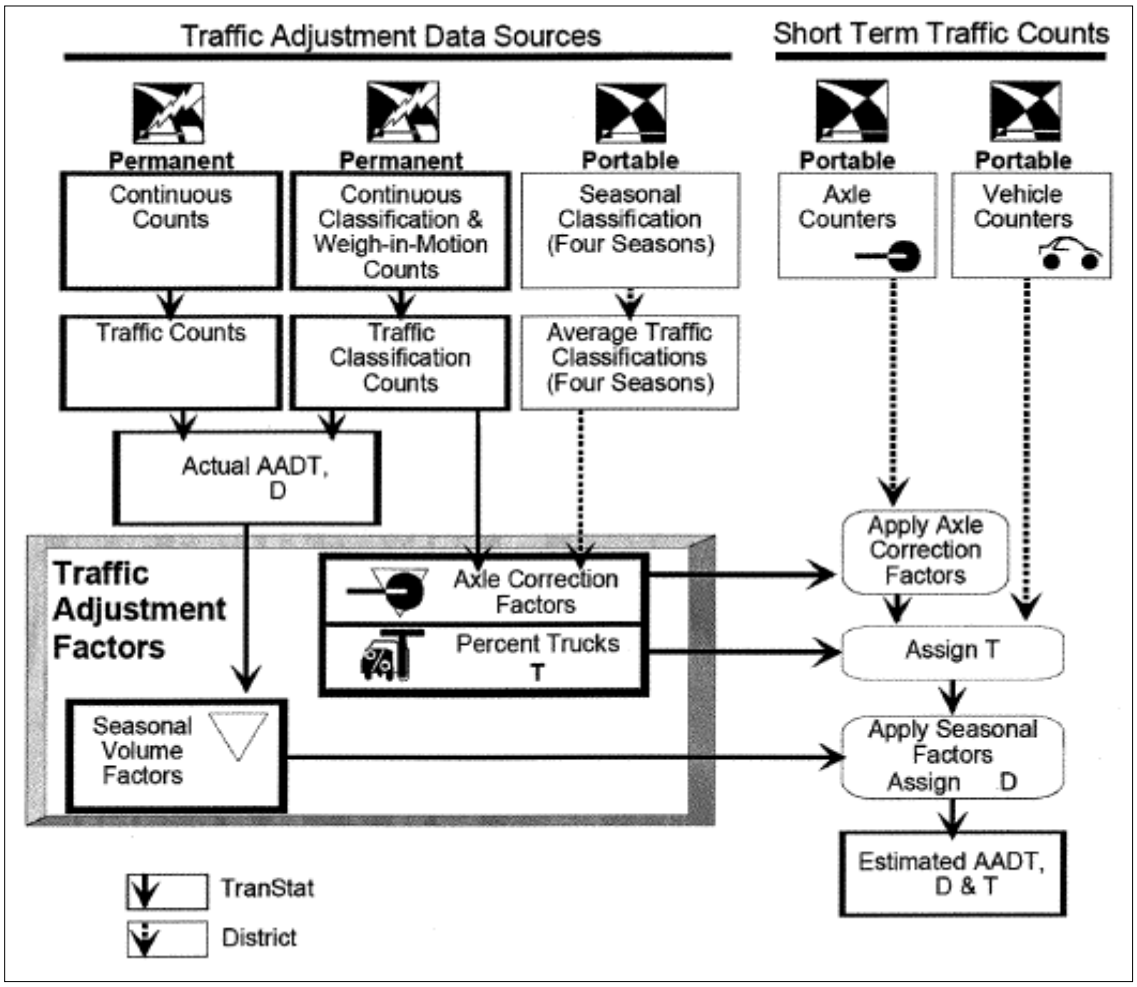
$$MSF = \frac{AADT}{MADT}$$

Weekly Seasonal Factors (SF) are developed by interpolating between the monthly factors for two consecutive months. The Seasonal Factors are calculated for each week of the year for each permanent count station and printed in a Peak Season Factor Report. Figure 3.7 shows an example of a Peak Season Factor Report showing the SF. The SF and Axle Correction Factors are used to convert ADT to AADT.

2.5.2 Axle Correction Factor (ACF)

The Axle Correction Factors are determined by using the data from continuous and portable classification counts following the guidelines as described in the FHWA *Traffic Monitoring Guide*.

TRAFFIC COUNTS, SEASONAL FACTORS, AXLE CORRECTIONS, AND ESTIMATED AADT, D, & T



* Traffic Adjustment Factors are assigned to each Short Term Traffic Count for every Section Break of the State Highway System

Figure 2.3 Process Used to Estimate AADT, D, & T

Actual AADT, D, and T data are measured at continuous counters. At all other locations, the AADT, D, and T are estimated. The data collected at the continuous count stations are used to develop the traffic adjustment factors: Axle Correction Factors, Percent Trucks, and Seasonal Volume Factors. These adjustment factors are applied to short-term traffic counts taken by portable axle and vehicle counters to estimate AADT, D, and T for every section break of the State Highway System.

2.6.4 Percent Trucks (T)

The most critical factor to pavement design is the percentage of trucks using a roadway. The structural design is primarily dependent upon the heavy axle loads generated by commercial traffic. The estimated future truck volume is needed for calculating the 18-KIP ESALs for pavement design.

Because there are numerous classes of trucks (*see* Figure 2.2), and different applications of truck data, various definitions of truck percentages are used. Truck percentage definitions (*see* Section 1.5) include **T_f**, **T_{24}**, **24T+B**, **24T**, **DHT, DH2**, and **DH3**, and are all calculated as percentages.

The traffic forecasting "T" is the same as T_{24} or 24T+B. It includes the trucks and buses from Categories 4 through 13. The truck volume and AADT are related to each other by a ratio commonly known as "T." The **Daily Truck Volume (DTV)** can be derived by multiplying AADT x T.

$$DTV = AADT \times T$$

For traffic forecasting purposes, the Design Hour Truck (DHT) is defined as T divided by two, based on the assumption that only half as many trucks travel on the roadway during the peak hour. The DHT is derived by dividing T by two.

$$DHT = \frac{T}{2}$$

The truck percentage is usually assumed to be constant over time. More research is being performed both nationally and in Florida to determine if the current assumptions can be improved.

Attachment #9: Viewshed Mapping and Visual Impact Analysis

Viewshed Mapping and Visual Impact Analysis

related to Buena Vista/ Rockology mine proposal on La Bajada Mesa

Summary, with documentation, of presentation by D. Van Doren at BCC hearing, June 11, 2014

Executive Summary:

Viewshed Mapping, also known as Visual Impact Analysis, is a critical tool in land-use planning. According to one current standard textbook (*Site Analysis*, LaGro, 2008; see resource list):

"*Particularly in hilly and mountainous landscapes, where tourism is an important component of the local or regional economy, the [geological] skyline is a significant visual resource [that creates] a memorable image of Place*."

Imageability of this sort is recognized as a critical success factor for even small commercial development, and takes on dominant importance when tourism or real estate values are signficant.

Visual analysis has been done in the field with sketchbooks and cameras for over a century. However, such methods are today reserved for very simple or small sites, or where the client refuses to pay for proper visual impact analysis.

Viewshed analysis for regions, corridors, and individual sites has been successfully *computerized* since the 1970s, when the Federal Highway Authority and US Forest Service demonstrated such methods at a regional scale, notably on the redevelopment of I-70 over Vail Pass, Colorado. ESRI, a major center in development of Geographic Information Systems (GIS software), published "Land Planning Tools," an early methodology for computer visual analysis, at about this time. "Visual Landform Analysis" was released by Computer Terrain Mapping in 1997, by which time both analytical and graphic methods were becoming standardized. Today, visual impact analysis can be largely automated, using standard GIS software and widely available digital topographic maps. This allows analysis to include hundreds of viewpoints in a region, quickly and cost-effectively.

In the case of the application to mine La Bajada, the Applicant should have provided a complete visual impact analysis using standard modern methods. Instead, County staff were saddled with this responsibility, and put in the position of having to use outdated methods of visual impact analysis, from an inadequate number of locations, not representative of the many places within the County from which the proposed mine would be clearly and intrusively visible.

Resources:

Site Analysis: A Contextual Approach to Sustainable Land Planning and Site Design, James A. LaGro, Jr. 2008, Wiley, NY

Visual Landform Analysis, 1997, CTM Inc (Computer Terrain Mapping), Colorado; updated online at www.ctmap.com/ctm/landform.html

Time-Saver Standards for Site Planning, J. de Chiara and L.E. Koppelman, 1985, McGraw-Hill, NY

Site Reconnaissance and Engineering, H.C. Landphair and J. L. Motloch, 1985, Elsevier, NY

Land Planning Tools, ESRI (Environmental Systems Research Institute, developers of ArcGIS), Redlands CA. No date; first released in 1970s.

For a wide variety of software and services, search "viewshed mapping" or "visual impact analysis"

Inadequacies of Visual Impact/ Viewshed Analysis accompanying BV/Rockology Application

- Applicant's analysis uses photographs from a few selected points along I-25 and Waldo Canyon Road. The photographs show that 20-foot tall banners two or three feet wide are not very noticeable. This inadequately represents visual impact of the proposed mine because:
    - Applicant proposes gravel piles, structures and equipment, which the County land-use Code allows to be 36 feet tall, almost twice the height of 20-foot poles, and therefore less hidden by the topography.
    - Gravel piles are shown on the application as approximately 200 feet long and 50 feet wide. Proposed structures and equipment would also be much more substantial and wider than a three-foot wide banner, and thus far more visible.
- According to Rick Wessel, Archaeologist at NMDOT Environmental Development Section, "…there is a reason for not relying solely on photographic documentation of a viewscape. [In photographs] lens barrel distortion reduces detail along the horizon."
- Applicant's claim that mining operations will be within the excavation in later stages, and therefore less visible, are incorrect. As shown in the Application drawings, the *bottom* of the excavations in all phases will be completely visible from locations to the south and east. The wall of the excavation will only hide items within the pit from viewpoints to the north-east, and only from Phase II at the earliest, when excavation depth greater than 36 feet is achieved.
- Although the height of mining operations is limited to 36 feet, the dust from these operations will go much higher. Dust plumes are commonly 100-200m (350 to 650 feet) tall, and have been recorded as high as 10 km (6 miles) into the sky (*Essentials of Medical Geology*, Selinus et al., 2005, Elsevier; Chapter 18). Even a fifty-foot plume would certainly attract attention of vehicle occupants traveling I-25 and the Turquoise Trail, as well as being visible for hundreds of square miles. Conversely, when blown sideways on the windy mesa-top, dust reduces on-road visibility to dangerous levels.
- Two modern visual impact analyses were presented at the BCC hearing June 11 2014, and are attached.
    - GIS analysis from Rick Wessel of the visual impact from Juana Lopez section of the Camino Real de Tierra Adentro, which passes less than a mile from the proposed mine site. This analysis shows visibility of ground-level activities. Operations and materials higher than ground-level will be even more visible.
    - Analysis of sight-lines from five points along I-25 using Google Earth pathway profiles, by Don van Doren. Created from freely accessible online mapping data, these show that the operations will be partially or completely visible from many more locations than implied by the Applicant's analysis.

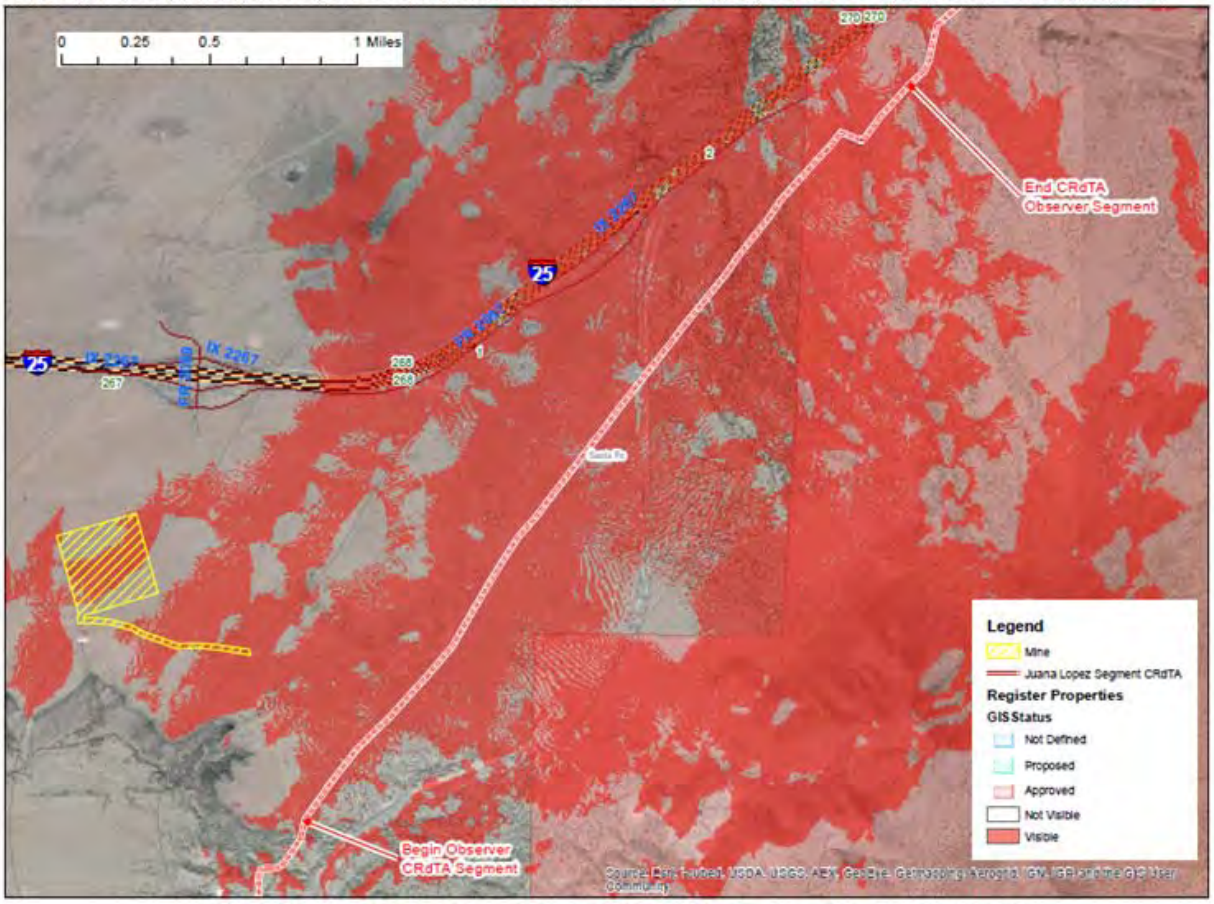
Computerized Viewshed Analysis, BV/R proposed Mine from historic Camino Real

2014 GIS analysis by Rick Wessel, archaeologist, NMDOT Environmental Development Section

Red indicates visibility of mine(yellow outline) from the marked trail segment

Figure 2: Viewshed Analysis from the Juana Lopez section of the Camino Real de Tierra Adentro

Using a digital elevation model generated from the National Elevation Dataset and a vertical offset of 1.5 meters to represent a hiker a bit over five feet tall

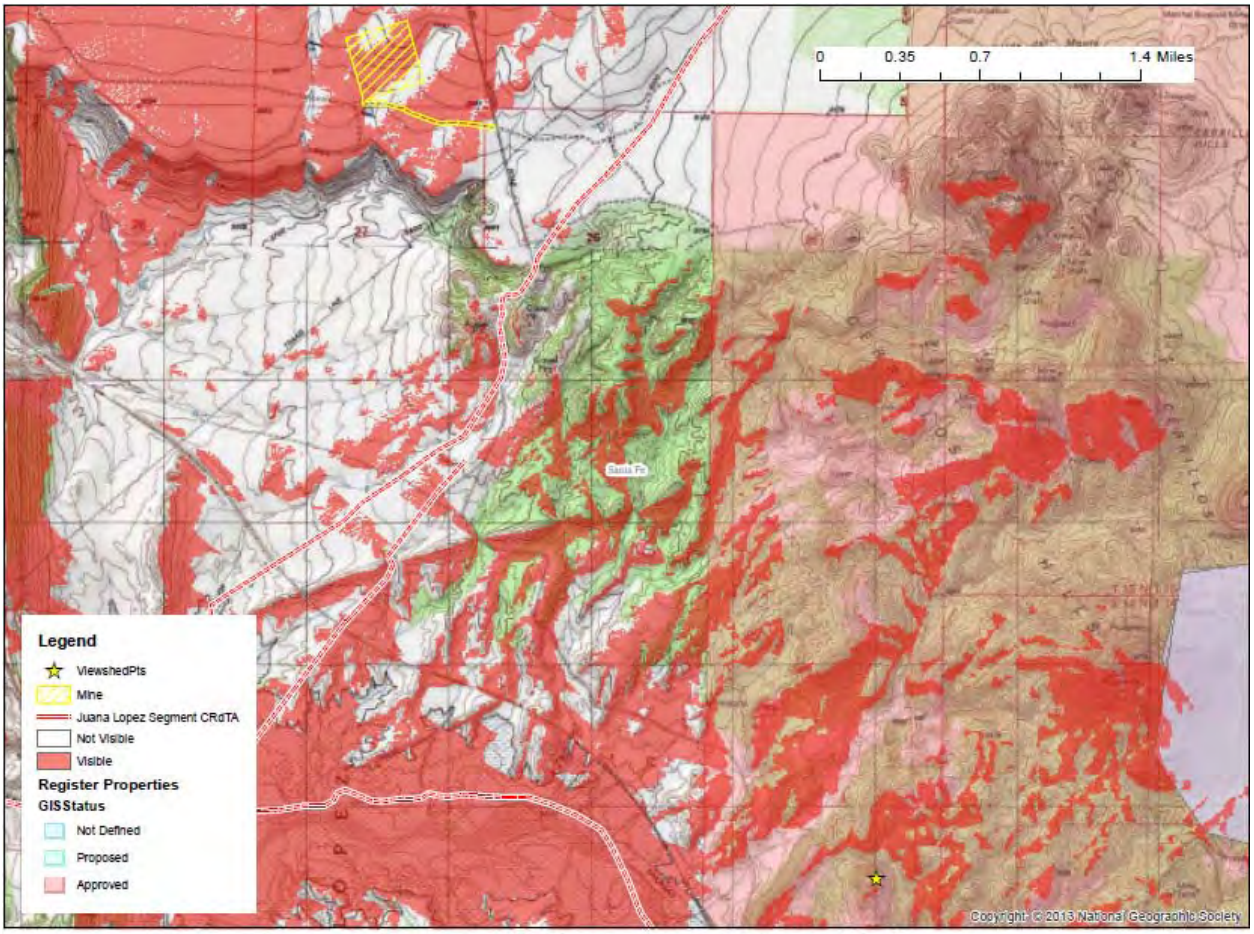


Viewshed from Juana Lopez Road Segment of Camiln Realds Tierra Adentro and Buena Vista & Rockology Mining Site

Computerized Viewshed Analysis, BV/R proposed Mine from Buffalo Mountain, near Cerrillos

2014 GIS analysis by Rick Wessel, archaeologist, NMDOT Environmental Development Section

Red indicates visibility of mine(yellow outline) from Buffalo Mountain (yellow star, lower right)



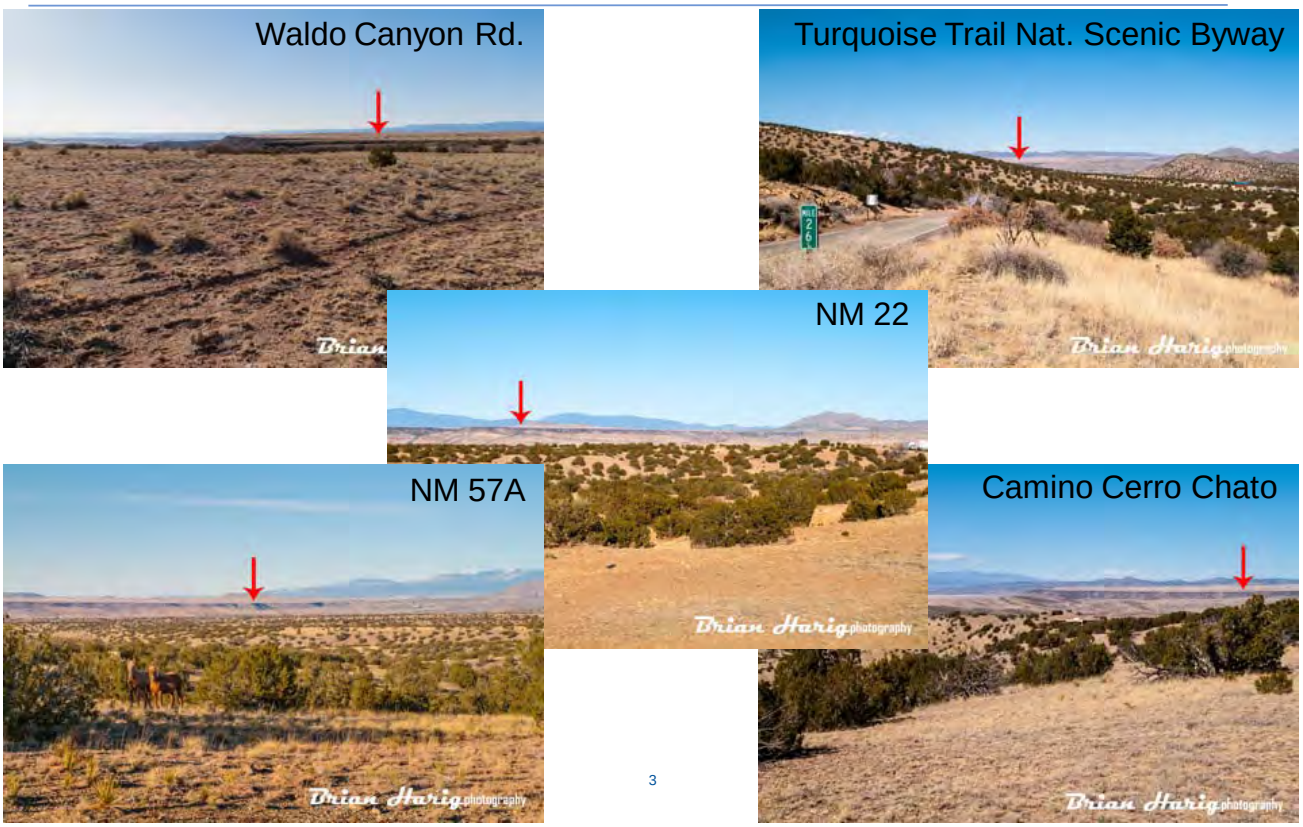
Viewshed from Buffalo Mountain and Buena Vista & Rockology Mining Site

Some locations from which proposed mine site is clearly visible
and from which GIS visual impact analysis should be undertaken

Not a comprehensive list Photographs by Brian Harig

Red arrows mark proposed La Bajada mine site

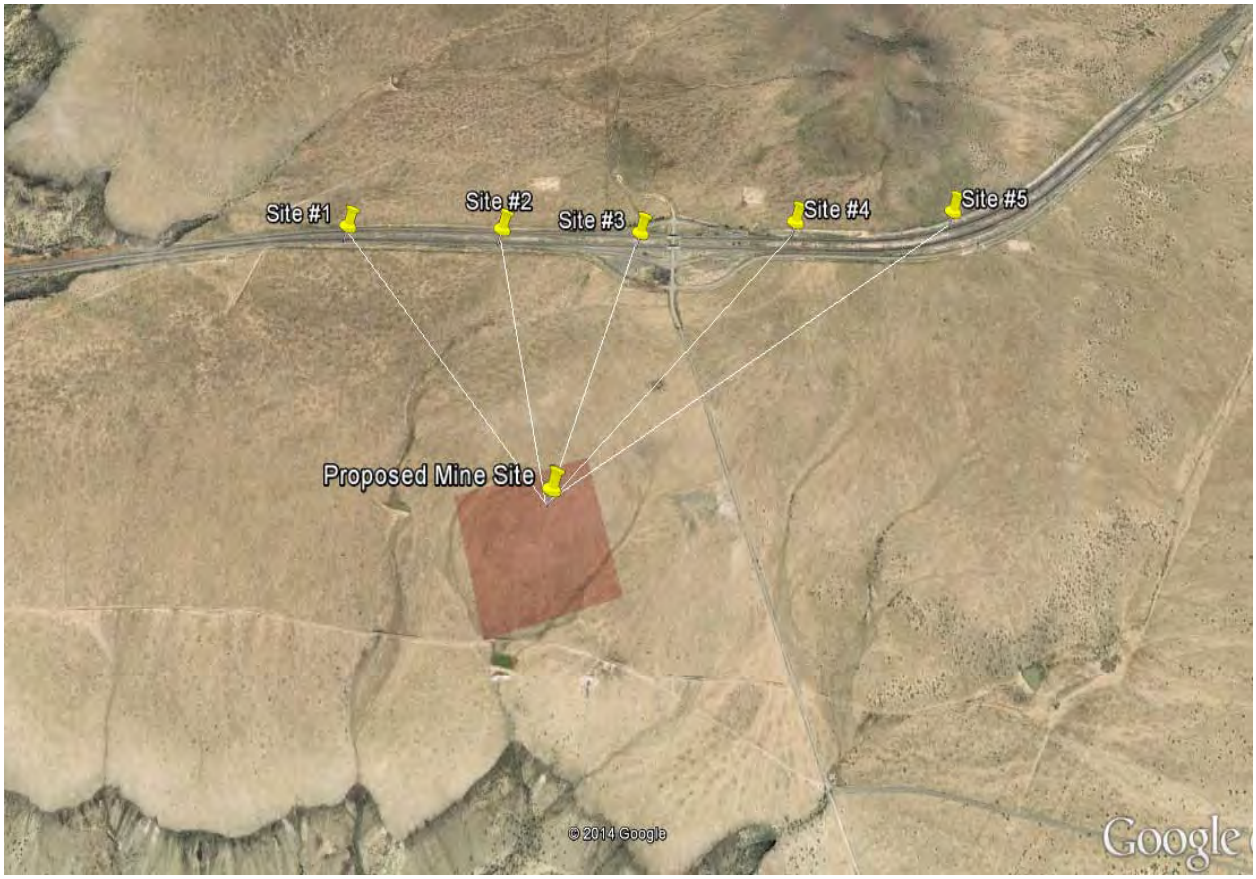
La Bajada Mesa Strip Mine
A Sampling of Visibility Perspectives



Views of Proposed Mine Site from Five Locations along I-25

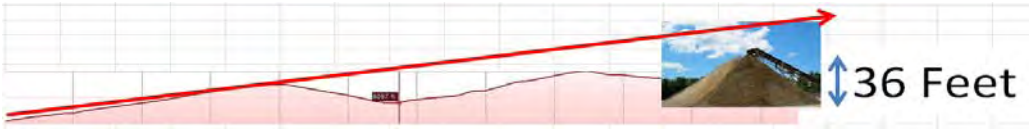
Analysis by Don van Doren, based on publicly available digital maps

Reference Map of viewpoints and lines of sight
Visibility for sites 1-5 shown on following page



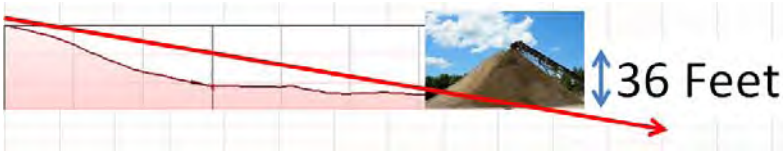
Views of Proposed Mine Site from Five Locations along I-25

Cresting the Mesa – #1 Elevation 6087– Dust is visible



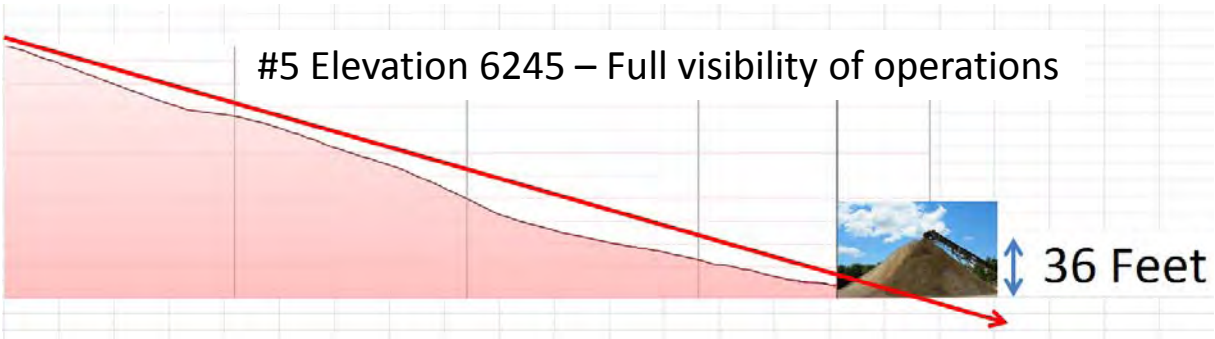
#2 Elevation 6124– Structures or gravel over 20 feet visible

#3 Elevation 6154– Full visibility of operations



#4 Elevation 6204– Full visibility of operations

#5 Elevation 6245 – Full visibility of operations



Attachment #10: "*From $300 to $1200 per Acre in One Day*"

1

THE SANTA FE REPORTER

A Weekly Journal

City Edition

SANTA FE'S LOCALLY OWNED NEWSPAPER Vol. 4 No. 47 Thursday, May 18, 1978 20 Cents

Photo by Tony O'Brien

The Promised Land

An Investigative Report

By Frank Clifford

For the past five years, a small group of land promoters has been working quietly and energetically to sell, parcel by parcel, a huge tract of land on the highway to Albuquerque 15 miles south of Santa Fe. Called The Ranch, the 11,600-acre tract, mapped in outline form above, has been sold in a pyramid scheme to investors who were told the site is perfect for a new city of 70,000 people. The promoters behind the scheme stand to make millions of dollars in profits—unless uranium mining, lack of water, or the law shuts them down.

Other Stories on Pages 3 and 5

They call it "The Ranch": 11,600 acres of hogback and plateau on the lip of La Bajada mesa 15 miles south of Santa Fe that has become the magnet for a multimillion-dollar real estate speculation scheme.

Once a sprawling cattle ranch owned by former New Mexico governor John Simms, it now is being peddled as the largest piece of private land along the 60-mile corridor between Santa Fe and Albuquerque.

The people behind the deal, three New Mexico real estate brokers including Peter Naumburg of Santa Fe, so far have drawn more than 300 investors to the property and generated close to $8 million in sales contracts for land that barely cost $1 million five years ago.

Most of the participants have invested between $12,500 and $30,000 at the bottom level of a complex pyramid scheme. Included among them are residents of New Mexico and more than half a dozen other states, from California to New York.

Backers of The Ranch have been promoting it as the ideal setting for a new town—a 70,000-resident city, powered by solar energy and populated by people eager to avoid the traumas of urban existence in Albuquerque and Santa Fe.

That idyllic vision, however, is tainted by specters ranging from non-existent water to an Interstate highway slicing through the land. An earlier plan to develop a new town at the site ended in collapse seven years ago. The long-awaited Santa Fe County General Plan poses outright opposition to high-density population in that area. Moreover, both the county and the State Securities Commission, after learning of The Ranch from The Santa Fe Reporter, have launched investigations to determine whether the scheme is in violation of the law.

Failure of a new town to develop, or of an equally lucrative alternative to take its place, could result in significant losses for investors at the lower levels of the complicated financing plan. But whether the land is developed or sits untouched, full payment of already-signed purchase contracts by small investors will result in multimillion-dollar profits for the original promoters at The Ranch.

According to those promoters, their plan is a sound one based on solid research, designed to make money not only for them but also for anyone involved when the new city is built.

"The Ranch is my vision of a whole new living environment," said Albuquerque realtor Ernest Cummins, the member of the trio who bought the acreage and engineered the project. "The Ranch has been identified as an excellent site for a community based on solar, wind, and other exotic energies," reads a segment of the promotional literature distributed to prospective investors.

Local officials, however, take a different view of the property. An environmental analysis contained in the proposed Santa Fe County General Plan indicates that The Ranch is located in an area of the county least suitable for large-scale development. Poor water supplies, ground water contamination, steep slopes and fragile soils combine to make the area particularly unaccommodating, according to the plan.

If the General Plan is adopted by the Santa Fe County Commission, it would in effect impose countywide zoning laws. No new construction that did not comply with the zoning regulations could be undertaken. And under the most stringent recommendations of the plan, settlement of The Ranch property would be limited to one house per 40 acres—a total of 290 houses.

Yet a preliminary master plan commissioned by Cummins calls for a total of 24,000 dwelling units on The Ranch's 11,600 acres.

There are still other reasons for apprehension about the prospect of an ideal community on the mesa.

State Highway Department officials say a distinct possibility remains that a new section of I-25 between Waldo and Bernalillo will have to built. If the current contingency design plan is followed, the road would be built right through the Ranch property.

When interviewed, Cummins conceded that the construction of such a road "would be very detrimental" to any major development plans.

Mineral rights could pose another problem. Some 25 people unaffiliated with The Ranch own subsurface mineral rights to much of the property. Those rights give them license to explore or mine anywhere on that property.

While the promoters of The Ranch have been soliciting investments in the land for more than four years, county and state officials responsible for overseeing land and investment transactions say they have had no knowledge of the enterprise.

[Continued on page 8]

2

From $300 to $1200 per Acre in One Day

An Investigative Report

THE RANCH

By Frank Clifford

On one day, Sept. 9, 1975, a parcel of property at The Ranch quadrupled in value. The fourfold increase was not the result of improvements made upon the land. Nor could it trace to pressures of the marketplace, to purchasers clamoring to buy the property, whatever the price.

The incredible one-day rise in the land's cost was instead the product of a series of "paper transactions," deftly managed by three real estate promoters who already owned the land. And when their day's work was done, property that had started out with a value of $300 per acre had been elevated to a per-acre price tag of $1,200.

The 250-acre parcel of land had been sold the previous year by Ranch owner Ernest Cummins for $300 per acre to a limited partnership call Mesita de Santa Fe, headed by Albuquerque realtor Lauren Peppler and including Cummins himself. With Cummins and Peppler, Santa Fe realtor Peter Naumburg comprised the original development trio at The Ranch—and on Sept. 9, 1975, they were ready to act.

First, the Mesita partnership sold the $300-per-acre land to Peppler as an individual, at a per-acre cost of $1,000. Next, public records show, Peppler sold the parcel to Naumburg at $1,080 per acre. Finally Naumburg sold it, at $1,200 per acre, to another partnership, called Mesita Two, which he himself headed. Two of the other members of that nine-man partnership were Cummins and Peppler.

When the dust settled, the flurry of transactions had benefitted Cummins, Peppler and Naumburg in at least three ways:

First, the precedent of selling land at The Ranch for $1,200 per acre, the same price charged subsequent investors in the scheme, had been set.

Second, duly documented land sales had established a $1,200-per-acre value that would have to be reckoned with should the State Highway Department condemn portions of the property for a new corridor for the Interstate 25 highway.

And third, according to Naumburg, the fast-shuffle transactions between him and Peppler enabled both of them, as general partners in their respective partnerships, to pay themselves commissions without paying sales taxes on the deals. Under the structure of the deals, their commissions were disguised as profits on land sales.

Looking back recently on the final aspect of the dealings of Sept. 9, 1975, Naumburg admitted that the interim exchanges between Mesita de Santa Fe, Peppler, and himself were "phony" transactions. Then he chuckled.

"We did it that way one time," Naumburg said. "Then my lawyer suggested it wasn't the best way to do things."

Photo by Tony O'Brien

'It Is a Sales Spiel, and It Is Not True'

The Ranch, they tell you, offers just about the best opportunity for investing in raw land anywhere west of the Pecos and east of Albuquerque.

The promotional literature on The Ranch tells you that the price per acre you pay is "well below market." It says that it is very difficult to find comparable land at any price.

It is a sales spiel, and it is not true.

In 1975 Peter Naumburg, a Santa Fe real estate broker and principal in The Ranch investment project, began participating in the sale of Ranch property to new investors.

He and his associates began selling the land at a price of $1,200 per acre in parcels of 100 to 250 acres.

During the same period, Naumburg also was involved in adding to Ranch property, in particular by buying a 356-acre tract that originally had been part of the ranch owned by former governor John Simms but had been acquired during the early 1970s by a Chicago firm.

The 356-acre parcel contained many of the best features of parcels offered to Ranch investors.

It lay close to existing roads and offered access to gas, electricity and telephone lines. It was not merely comparable to The Ranch property. It had more potential as a site for commercial development than did a great many of Ranch parcels being offered to investors.

Yet while the investors were paying the so-called certain price per acre of $1,200, Naumburg paid only a third as much—$421 per acre for the parcel he bought.

Naumburg's purchase is not the only example of recent real estate transactions in which property near The Ranch has been sold for cheaper prices.

State Highway Department records of private land transactions during the past three years show that undeveloped land near The Ranch has been selling for as little as $280 to $300 per acre in parcels of less than 100 acres. These prices were being paid during the same period when Ranch parcels of 100 to 250 acres of undeveloped land were commanding prices of $1,200 and $1,250 per acre.

But you don't hear about those prices from Ranch property promoters.

Instead, they hand you a map of the area surrounding The Ranch, with figures written in purporting to demonstrate how high prices are in the vicinity of the investment property. Those figures could lead you to believe that property anywhere in the vicinity is selling for prices that range from $2,000 to $40,000 per acre.

But curiously, the only such expensive lots noted on the map happen to be located in well-established well-watered spots: the Downs at Santa Fe race track, Cochiti Lake, and the villages of La Cienega, Cerrillos and Madrid. No recent sale price for arid outback land, such as the property at The Ranch, is mentioned.

The Ranch sales spiel falls short of full disclosure in other areas as well.

It says that artesian and well water is present on the property. It does not say that official studies have concluded that there is virtually no surface water and that ground water in the general area is scarce and often highly contaminated.

The sales pitch tells you that the property offers convenient access to three maintained state and county roads. It does not tell you that a State Highway Department contingency plan calls for rerouting Interstate 25 directly through The Ranch property if current efforts to expand the existing I-25 corridor from La Bajada to Bernalillo break down.

The present route passes through Santa Domingo Indian land south of La Bajada, and the department has been trying for years, so far without success, to reach a mutually acceptable agreement to acquire Indian land for the purpose of expanding the present I-25 right of way.

But since 1975, according to department officials, alternative routes for the interstate have been planned in case they are needed. All three of the alternative routes that have been mapped out pass through The Ranch.

Ernest Cummins of Albuquerque, the driving force behind The Ranch, conceded recently that the effect of the road going through the property would be very detrimental to development plans.

On the subject of subsurface minerals, the sales pitch states that Ranch investors and Union Carbide Corp. control all mineral rights attached to the property. In addition, it states that Union Carbide, which has been exploring for uranium on the land, would have to share the fruits of any uranium "harvest" with investors.

In fact, Union Carbide owns no mineral rights on the property. It is currently leasing them from some 25 people, not affiliated with The Ranch, who with Cummins own all the mineral rights on the property. For purposes of promotion, the potential role of Union Carbide has been hailed: "If Union Carbide should decide to harvest minerals, the picture would change from only an outstanding land investment to something even more rewarding," prospective land buyers read in the sales spiel. What they are not told, however, is that Cummins has tried his best to force Union Carbide off The Ranch

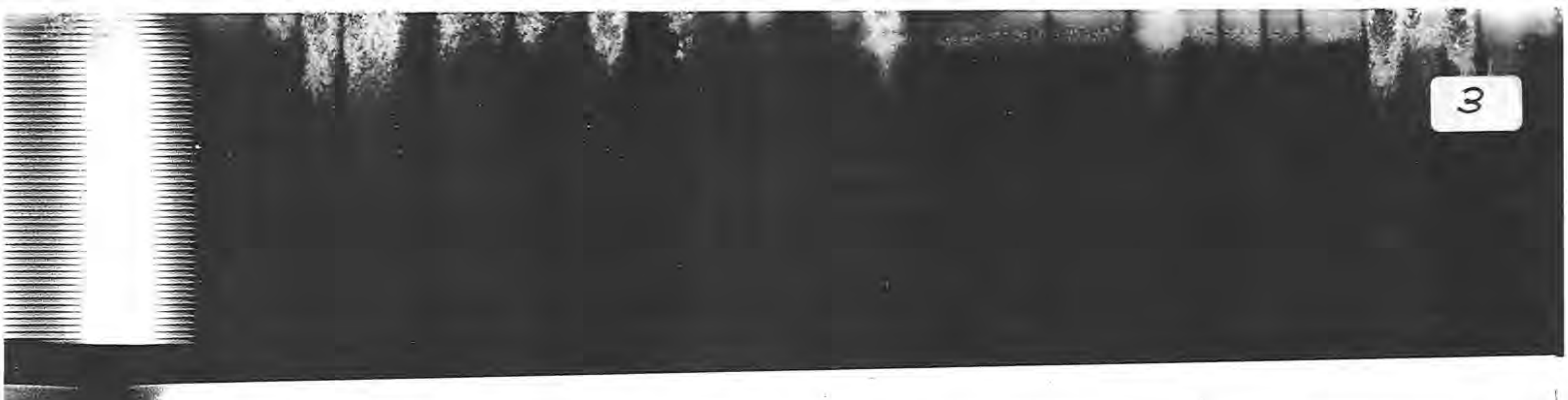
Unlike the other mineral owners, Cummins chose not to lease his rights to Union Carbide. And last month, he took Union Carbide to court in an effort to compel the company to get off the land. In his lawsuit, Cummins said Union Carbide's presence was doing "irreparable damage" to the land and that its exploratory work could endanger real estate development plans.

Cummin's suit was thrown out of court, and Union Carbide was permitted to stay on the land.

More important, mineral owners, whose rights take priority over surface owners, are virtually free, if and when valuable underground deposits are discovered, to do what they want in the way of drilling and mining on the property, providing they compensate surface owners for any damage done to surface property.

Their license to probe the land, combined with the growing interest in uranium exploration across La Bajada mesa, could prove to have an inhibiting effect on any plans for real estate development at The Ranch.

But in the hands of the promoters, the question of mineral rights at The Ranch, like so many other aspects of the development scheme, has remained far below the surface.



the Top of the Pyramid: Millions in Profits

terms, The Ranch is a plain, a windblown land with an unknown capacity for

terms, The Ranch is a pyramid with a to generate millions of dollars for those to the apex.

mins, an Albuquerque realtor, stands on apex. He bought The Ranch in 1973 from the exico governor, John F. Simms.

the terms of the sales contract, Cummins more than $1 million for 11,298 acres of began paying for the property through allments of $100,000 at six percent interest.

he contract on file at the Santa Fe County oes not indicate that Cummins was required own payment. Rather, the first was to be later in April of 1974. (Peter Naumburg, a ltor and an associate of Cummins, said that make a down payment.)

terms of the contract with Simms, Cummins about $100 per acre for the property.

1974, when the first installment was due, that Cummins had raised $140,000 through the resale of 4,000 acres of the same land he was buying from Simms. By June of that year, through the sale of another 2,500 acres, he had raised an additional $60,000 in cash, according to the records.

Cummins raised the money by negotiating sales contracts with three investor groups. In addition to their down payments, the three groups contracted to pay via annual installments a total of $1,785,000, most of it bearing seven percent interest. (One group contracted to pay just six percent.)

Thus, in one year's time, Cummins had signed contracts calculated to give him double his money back. He paid slightly more than $1 million and would get back slightly more than $2 million. Moreover, he still owned more than 40 percent of the land he had bought.

At that point, The Ranch speculative venture had just begun.

In his three 1974 transactions Cummins had raised the price of the land from $100 per acre to around $300. During the next year the price would rise sharply.

In 1975 the three investor groups began selling off large portions of the land they were buying from Cummins. And in each of the investor structures, Cummins himself was still very much in the picture. He was a controlling member of one of the groups and a participant in the other two.

Naumburg and a second Cummins associate, Lauren Peppler, also participated as controlling partners in two of the three original investor groups. They would control other groups to be formed later. And Cummins would re-emerge as the general partner of yet another group established in 1976.

By the end of 1976 the first three investor groups had sold 2,709 acres, about 40 percent of the land they had bought from Cummins.

But they had sold that 40 percent for more than $3 million against the $2 million they had paid. In addition, the 30 or so investors in those first groups also had agreed to pay almost $400,000 in interest on the sales.

The original investor groups had bought the land at about $300 per acre from Cummins in 1974. Their sales price to the next level of investors during the next two years, however, was $1,200 per acre. In The Ranch's pyramid financial structure, they were selling to a third level, which brought in about 120 new investors. But several of those third-level groups were headed once again by Naumburg, Peppler and Cummins. Thus, the

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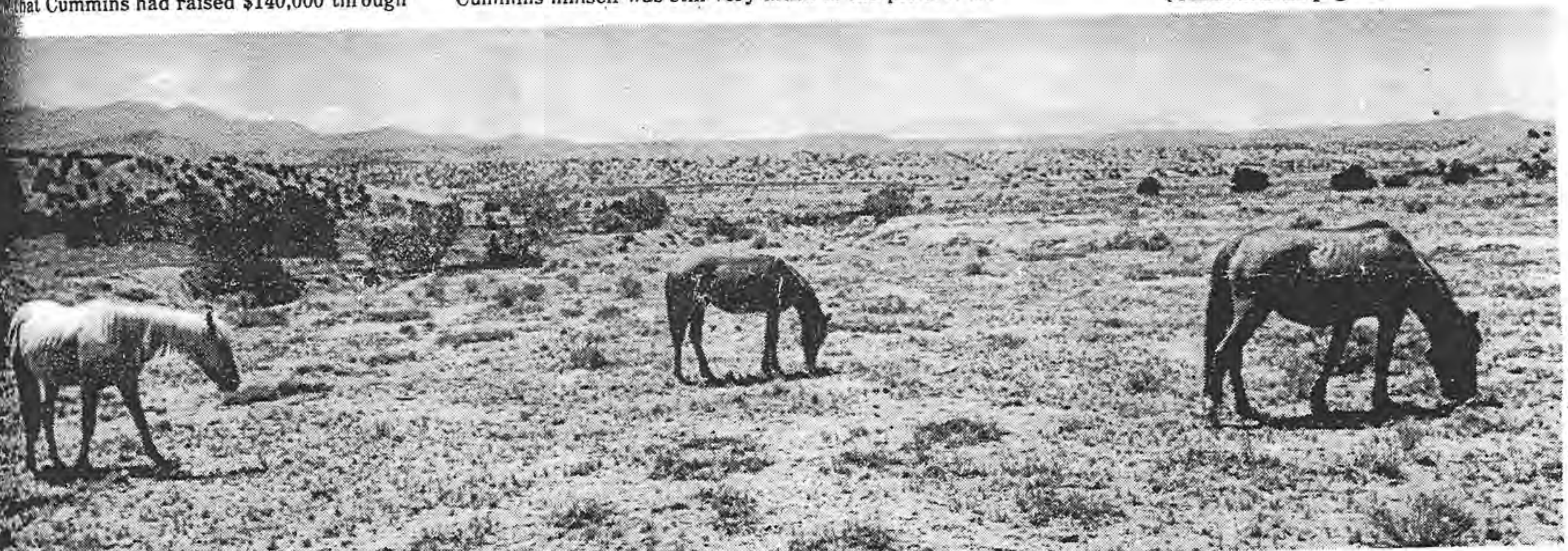


Photo by Tony O'Brien

he Laws—And How to Avoid Them

THE RANCH

An Investigative Report

By Frank Clifford

te laws govern the conduct of real estate sales ike The Ranch.

he New Mexico Subdivision Act, designed to hat land being divided and sold into several ntains adequate resources, such as water, to ommunity life.

ond law is the New Mexico Securities Act. Its to ensure that an investment project is "fair, equitable" through an investigation of the venture. The act also permits the state commissioner to exempt small, relatively entures, including certain limited partnerships, estigation.

he act, all investment ventures, including ones he exemption, must notify the commissioner of ntion to do business in the state.

omoters of The Ranch acknowledged in recent that they did not comply with the notification of either law and, as a result, avoided opening project to official scrutiny.

Cummins and Peter Naumburg, two of the in The Ranch, said their lawyers advised them project did not fall under the jurisdiction of law.

o elaborate, the two men said they themselves nderstand the fine points of real estate and law and could not explain why The Ranch fall within the scope of those laws.

can say is this: We wouldn't have the prominent involved that we do have if there was anything out this deal," Naumburg said. "It's the cleanest e ever seen."

rominent investors he was referring to include State Treasurer Kenneth Johnson, State Rep. Malry (D-albuquerque), two bank officials and doctors and lawyers.

rtheless, two officials here, Santa Fe County Earl Potter and New Mexico Securities sioner A.M. Swarthout, said last week they have separate investigations to determine if either the sion law or the securities law has been violated by ch project.

The subdivision law requires that anyone dividing a piece of property into five or more parcels for the purpose of sales in Santa Fe County must show how the property can be made suitable for development.

For example, the subdivider must be able to guarantee the availability of water for at least 40 years. "If someone is found guilty of violating the subdivision law, that person can be fined as much as $1,000 for each piece of property illegally subdivided.

Records in the Santa Fe County courthouse show that The Ranch's original promoter, Ernest Cummins, has divided and sold about 20 parcels of Ranch property during the past five years.

Moreover, Cummins indicated in conversation he was not completely confident of the advice he apparently received that his transactions were not subject to the subdivision law.

"I think it's probably a debatable point. I think it's questionable."

The sale and resale of property at The Ranch has been carried out through transactions involving investment groups known as limited partnerships. More than 25 such partnerships, each consisting of 10 to 15 investors, have been established to buy and sell Ranch property.

Public records show, however, that only two of the partnerships filed notice with the securities commissioner in efforts to seek the exemption. In addition, the records do not reflect that the remaining partnerships filed any kind of notice with the commissioner.

The point of the legal restrictions is to insure that the limited partnership is a small investment entity, both in terms of the number of participants and the financial liability of the general partner.

By not filing notice of their existence with the securities commissioner, the limited partnerships avoided the risk that they would be ruled ineligible for the exemption.

Without the exemption they would have been subject to the official investigation normally made into larger investment groups.

The purpose of that investigation, done by the securities commissioner, is to make sure that any large-scale investment scheme is "fair, just and equitable"—in other words, that investors stand a reasonable chance of benefitting financially from the project into which they are putting their money.

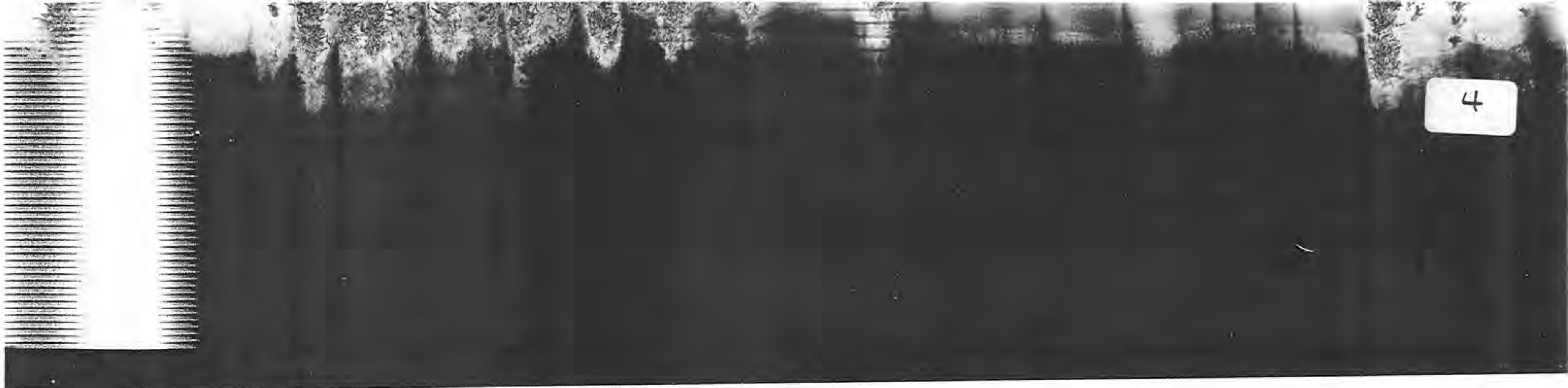
If the scheme involves investing in land, part of the commissioner's examination may be aimed at determining if the land has the potential in terms of future sales or development to reward the investor.

"In making a determination I would be inclined to ask many of the same questions that the subdivision law raises," securities commissioner Swarthout said. "For example, I would want to know if there was water. And I would want to know if the project was likely to fall afoul of any local regulations like the county plan."

Someone who violates the securities law also is liable to criminal prosecution. A conviction can lead to the imposition of $5,000 fine and a three-year prison term.

"It is possible that he (the securities commissioner) could find some problem on paper as far as what we've done," Naumburg said. "But he'd find no problem as far as intent.

"People got involved in this deal because they knew us and trusted us with their money. We're going to take care of the investors. No one has gotten hurt. That's the important thing. And no one is going to get hurt."



of the Pyramid

[Continued from page 5]

in the pyramid could manipulate sales prices to groups which they themselves controlled. at the same time that Cummins, Peppler and were selling land at $1,200 an acre, Naumburg the only piece of the original Simms tract that had not acquired. It was a 356-acre parcel with frontage on two roads. Naumburg bought it cago firm for $421 per acre.

According to the records, 16 groups had been buy and sell parcels of The Ranch. Cummins, or Peppler were involved in eight of them. the next 16 months Cummins began selling off a portion of the approximately 5,800 acres he viously sold. He sold the property in tracts of 250 acres to 17 new partnerships, many of were organized or headed by employees of andmart Realty of Albuquerque.

17 partnerships, he sold the land for $1,200 per acre, for a total of just over $2.6 including interest, which could amount to an 300,000, according to the records.

years after he bought the Simms Ranch for than $1 million, Cummins had personally 60 percent of it for more than $4.5 million. In Naumburg and Peppler each had benefitted million worth of sales negotiated by the first erships.

yet another way in which the venture ash for Cummins.

fter he had signed the contracts with the first ment groups in 1974, he used those contracts for a $750,000 loan which he received Rio Grande Valley Bank in Albuquerque. resident Richard Elkins signed the loan, court records. And Elkins himself became an Juana Lopez Limited Partnership, one of the investment groups whose contracts were collateral.

in a recent interview that he was not one of Juana Lopez investors but that he bought rtnership sometime after it was formed. He did then.

Records indicate that Cummins paid back the Rio Grande Valley Bank but on the same day 500,000 from the First National Bank of Santa using the contracts with the three groups as

, the bank officer who signed the loan became an investor in one of the partnerships anch property.

Banking law defines such loans, in which a is involved on both sides of a transaction, as It can be done leagally providing the bank question makes a full disclosure of his to the bank's loan-approval committee.

of this year, more than 300 people had oney in The Ranch. Most were bottom-level They are not presently on the selling end of

and Naumburg says they are confident these make money eventually.

say they are working on a plan to sell The 3,000 per acre to a developer interested in full-fledged community on the property. If happen, say the two realtors, bottom-level who bought in at $1,200 and $1,250 an acre ive $2,500 per acre.

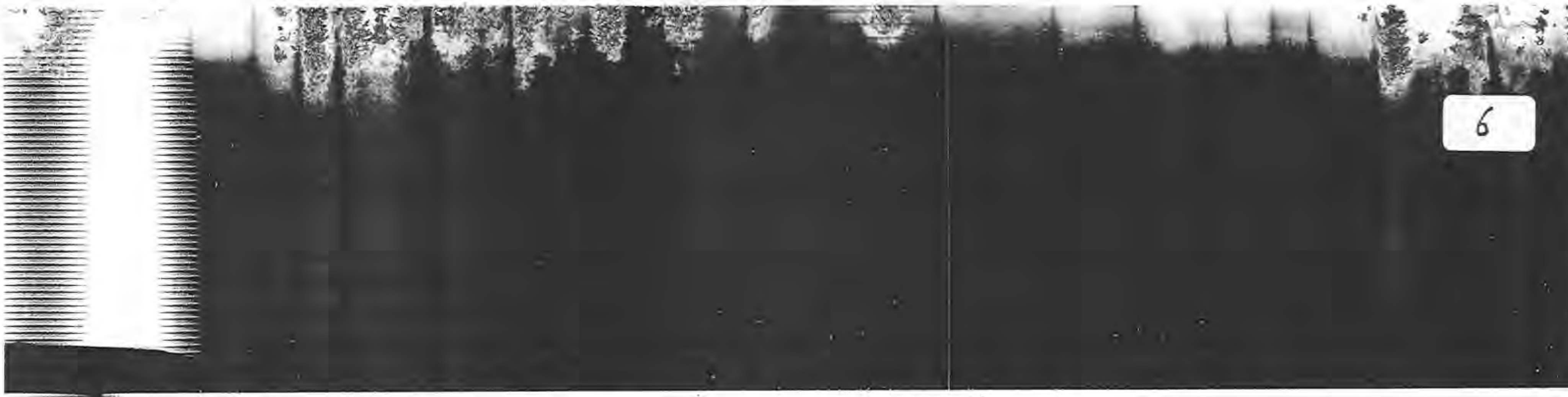
work in putting together the deal, the Ranch would pay themselves the remaining $500 per they would gross an additional $5.5 million bove what they have already made. Cummins burg said last week they have not yet located a Cummins said he already has spent $20,000 in ake The Ranch appealing to a developer. "I'm ke it as enticing and as easy as possible for person to come along and buy it up," he said. nder the proposed scheme, it would cost a more than $30 million just to buy the property. would be required to spend millions more roads, sewers and generally making it fit for ers. A water system alone could cost several llars to build.

1971, Santa Fe officials, citizens groups and onsultants have viewed the area where The cated as one of the county's least attractive for

adoption of a proposed county general plan, final stages of preparation, would make it impossible to develop a community on The operty.

Ranch promoters continue to talk in optimistic

, for one, said he has little respect for the county officials and county consultants. eople, those consultants . . . When it's all over, to wish they had put their money where is."



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estors Bought The Ranch Without Looking

By FRANK CLIFFORD

investors in The Ranch, the mammoth ation project now under investigation by state officials, readily admitted they never looked at efore investing in it.

t seen it," said state Rep. Lenton Malry, an e Democrat who would have passed by The y time he commuted from his home via I-25 to egislature here.

h became the focus of official scrutiny—by the rities Commission, the attorney general's office nta Fe county attorney—after a recent series of Reporter articles raised questions about the d feasibility of the Ranch investment project. about 11,600 acres, is located approximately 20 h of Santa Fe and is easily viewable and from U.S. Highway I-25. The majority of according to available records, live within a dius of The Ranch.

mber of investors, Malry said he decided to put he Ranch at the recommendation of a friend. In e friend was Ernest Cummins, one of three men ved of The Ranch venture and who have stood e most money from it.

Cummins is a neighbor of mine and he just sold dea that it was a good investment," Malry caid. d that his total pledged investment was around e sum invested by most of the 300-plus investors ipating in the project.

ir Force Col. Bucky Walters is another e investor who said he put money into the project without first looking at the land or investigating its potential.

"A friend of mine said it was a good deal, so I though I'd take a flier," Walters said Monday. "I never went to see it. I didn't ask anyone in Santa Fe about it. I did ask a couple of realtors in Albuquerque, but they didn't know anything about it . . . I'm just one of those guys who agreed to put down $100 a month and hoped to double my money one day. Maybe I was dumb."

At the time they were interviewed, neither Malry nor Walters had seen Santa Fe Reporter articles concerning The Ranch.

The newspaper articles, published last month, revealed that:

- The Ranch project, involving some $8 million worth of real estate sales through a vast network of investor partnerships, was carried out over the past five years without the knowledge of state and county officials responsible for approving subdivision of land and the sale of securities.
- The promotional material used in attracting investors to The Ranch omitted any discussion of possible risks involving the availability of water, the construction of new roads and the pre-existing rights of mineral owners on the property.
- The final draft of the county's general plan characterizes the area where The Ranch is located as one of the least suitable for future development.

The articles also disclosed that even if The Ranch is not developed, the handful of people who initiated the project stand to make millions of dollars on the basis of investments solicited over the past few years.

Most of 10 investors interviewed recently said they had put their money in The Ranch with the expectation that demand for the land would allow them to resell at a profit within two to fve years from the time they invested.

"The sales pitch was that The Ranch was the sort of property that would be appealing to a large-scale developer," said investor Randy Sabre of Albuquerque.

Sabre said he invested—through a limited partnership—in a parcel of the Ranch property that he believed would have commercial development potential if it turned out that the entire Ranch site was not purchased for a single massive development.

Sabre said his parcel of land was located south of La Bajada Hill adjacent to I-25."So even if the dream of a big development should fizzle I think I'm pretty well situated to recoup my investment," he said.

Sabre said he invested in the property during the past year. He was asked if he was aware of planning by the State Highway Department that could lead to a rerouting of I-25 in such a manner that the road no longer would abut his property. (The planning has come about because of the inability, so far, of the department to negotiate with the Santo Domingo Pueblo for more land needed to widen I-25 south of La Bajada and The Ranch. For the past several years the state has been trying to work out a price with the Indians for the property necessary to broaden the highway right of way through Indian land. If an acceptable price cannot be negotiated, highway officials say that I-25 probably will have to be rerouted east of its present course. For the past three years officials say they have been doing contingency planning, including mapping out

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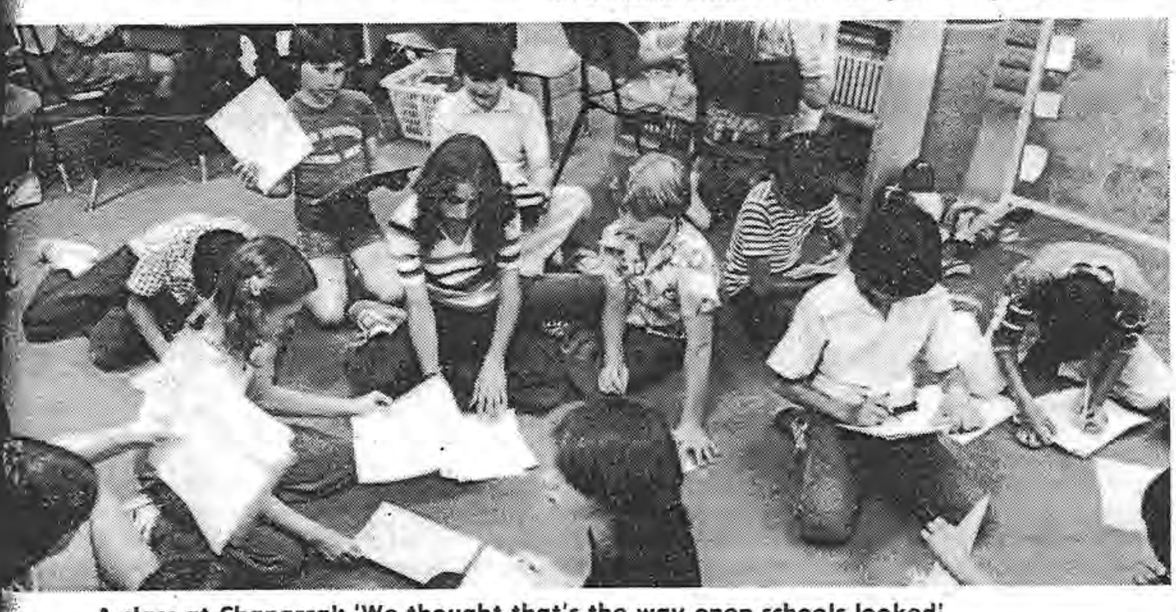


A class at Chaparral: 'We thought that's the way open schools looked'

Parents Figure Out What to Do

wo weeks ago Jerry Ortiz y Pino, like most of Chaparral Elementary School students, everything was just fine over there.

e had noticed that the huge room where his d and 416 other children were taught in the room system seemed rather crowded, he said, thought that's the way all the open schools

eports of overcrowding and poor ventilation in the May 25 edition of The Santa Fe Repor- y Pino said, "most of us would have said there oblem. I think everybody was counting on the ministration to take care of things."

ddenly last week, as part of the aftermath of accounts, Ortiz y Pino found himself selected esman for a group of anxious and confused parents determined to confront the angry dministrators and board members at the scheduled June 7 meeting of the school board. he would be carrying a petition signed by of parents demanding immediate improve- he Chaparral school's ventilation system and a of more than 100 in enrollment.

startling turnabout from the day in mid-May Chaparral teacher had said of the parents, them, not a single one, has said, 'What can we

urried preparations for the June 7 showdown, ino said, he found he needed to have at his rafts of data which usually takes experts ompile—data like the number of housing units the next year in the La Paz and Candlelight ns near Chaparral, and the numbers of transfer students from Nava, Kearney and istricts.

And as he spoke last Monday, he had only two days left before the meeting.

"We're operating out of real ignorance," he conceded, as he busily made notes on a pad at his office in the PERA Building, where he is a planner in the social services division of the state Human Resources Department.

But this is not the first time Ortiz y Pino has jumped into the midst of a school controversy. Four years ago he was a member of a task force formed as a result of low test scores among the district's junior high students. The task force created a social work program within the school system.

Ortiz y Pino was also very clear about one point he would stress to the school board June 7 as the parents' spokesman.

It was that whatever other problems plague the Chaparral school, the parents do not believe its educational standards have dropped. "Parents are basically happy with the quality of education at the school," he said. They feel that the staff, under principal Imelda Baca, is unusually fine, he said, adding that his son has had an excellent year in the second grade. (But next year David will attend the newly created Pinon Elementary School as the family lives south of Rodeo Road and falls within the new district.)

As to the insistent demands of the parents' petition, Ortiz y Pino said he felt optimistic that steps would soon be taken to fix the faulty fans that have stifled ventilation in the school's music room to the point that children reportedly have "vomited and fainted." He said he already learned that Santa Fe School Superintendent James Miller would ask the school board for funds for an

[Continued on page 8]

Inspectors Find Chaparral Lacks Room and Air

By HOPE ALDRICH

State building inspectors, called in by parents to inspect alleged overcrowding and poor ventilation at Chaparral Elementary School, have determined that the school this year enrolled 72 more students than is legal under the state building codes, and that ventilation there was "very poor."

In a report delivered Tuesday to the Construction Industries Commission of the state Department of Commerce and Industries, the inspector, Harvey King, stated that occupancy of the main school building should not exceed 345. The occupancy this spring has been 417.

The department can close a building if occupancy regulations are not complied with, a state official said.

King reported also that several of the huge roof fans intended to cool the building did not turn on when he flicked the switches during his inspection June 2, and the temperature had reached 75 degrees, too hot for classrooms, he said.

Teachers at the school have said they asked the school administration for repairs many times over the last five years but that the administration did not respond.

But last Tuesday, a day before the June 7 school board meeting at which Chaparral parents have said they will present a petition of complaints, Santa Fe school superintendent James Miller said he would request funds from the school board to hire an engineer to inspect the ventilation system.

Miller said funds for improvements to the faulty system, if recommended, could be drawn from the school district's operating budget or its minor-projects building fund. He added that he wanted the work done before school reopened.

This move seemed in contradiction to statements made by assistant superintendent for elementary schools Walter Wier on May 11. At that meeting, called by the teachers at Chaparral, Wier said no improvements could be expected next fall in either the overcrowding or the ventilation system, teachers said.

After that meeting, teachers called The Santa Fe Reporter, and in its May 25 edition, the newspaper detailed overcrowding and overheating problems, which teachers claimed were so severe they interfered with the children's education.

The recent building inspection report states "the ventilation in the building was very poor . . . The doors have to be opened to get ventilation, and this is a bad situation for the students being exposed to the outside elements . . .

"The occupant load of the building was checked and we

[Continued on page 8]

Holy Spirit

[Continued from page 2]

many that would be perversed in this hour... death of many singers, the hillbilly type singers... rock and roll singers. It will be catasterfee... catasterfee (sic)."

The revival audience grows excited as... speaks of his fulfilled predictions. He descr... America in which traditional religious values and standards have eroded, and the crowd is with... clapping hands and hissing "yes."

Padgett's text tonight is the "Biblical... Revelation" and, wrapping the tension tight... preaches fire and brimstone, death and de... Outside the wind has risen, and it whacks... makes loose flaps snap as thunder growls in the... in eerie counterpoint to his preachings.

"Repent" is the key word. The tempo incre... Padgett's voice rises until he is shouting... microphone and the overloaded sound system... fuzzy distorted words. "The harvest time is com... screams, and then releases his audience, ... forehead and begins again in a soft voice.

Time and again he does this, gradually heig... the rhythm of his preaching to a loud incessan... "God give a little TRUTH, ah, unto these PEOPLE ... Jesus is the LIFE, ah, Jesus is the WORD, ... with the odd inflections of an auctioneer.

Padgett's face is red, he is perspiring freely... has taken off his jacket. "Whoooo," he hollers... he says, and twitches, shivers as if he has felt... an electric shock, his feet beating, stamping the... an odd tattoo that raises puffs of dust.

"We don't want death," he chants. "We want... life is the woooord, ah . . . God's dealing with so... to get saved!" Padgett's head is tilted back, his... closed, and gradually members of the audience... toward the stage and the worn carpets, whe... kneel, their raised arms waving slowly like plan... water.

The people return finally to their seats and... calls for "people with needs." Three women,... small children, come forward. The preacher hea... whispered wishes, places his hand on the fore... each, and with his otherworldly shiver, prays f... with strange words—"Selah the miciah," he se... say. "Selah the miciah."

But this laying-on of hands is anticlimactic... lively narrative and choreography of the service... are no obvious miracles, and the revival meetin... down to the collection of offerings.

"God said someone would give $100 tonight,"... says brightly. But apparently no one does.

"Some say everyone with a tent is out for mon... I ain't," says Padgett, relaxed now and grinnin...

"Shake hands, be friendly and we'll see you to... night," he says, and the organ launches into a... tune as the audience files out of the big top. Fo... of the world, it is happy music.

Investors Bought

[Continued from page 3]

alternative routes for I-25.)

All of those routes would bypass Sabre's prope... Sabre said Monday he knew nothing of the con... plans. "This is the first I've heard about it," he... someone had told me anything about this a year... might not have invested."

Three of the 10 investors recently interviewed... although they were hearing for the first time abo... the possible risks associated with The Ranch... remained confident that their investments wo... fruit.

Mel LaVail, a retired Air Force officer who said... "heavily invested" in The Ranch, said this week he... year investigating the potential of The Ranch be... decided to become an investor.

LaVail said he grew confident enough of its pote... invest himself and to "get most of my friends and... involved." On the subject of water, he said he beli... there had been enough accidental finds durin... drilling operations to indicate that there are sub... water supplies beneath the ground.

While La Vail has been instrumental in gener... substantial number of investments in The Ranch... he has not been acting as an employee or agent... the principals in The Ranch. "I have been in som... deals with them," he said without naming name... got into this deal strictly as an independent inve...

"I spent a lot of time walking around the pro... standing at the edge of that cliff and looking out... valley. It's one of the most enchanting spectacles... seen. I'd like to build there myself one day. But wh... do that or not, I think my investment up there is... one," LaVail said.

"Maybe I won't make all the money I hoped to... my investment. But when push comes to shove... think you'll find I've lost my hat, ass and spurs on...

Attachment #11: Recalculation of BV/R Runoff using more realistic coefficients

STORMWATER RETENTION REQUIREMENTS
La Bajada Basalt Mine, Buena Vista/ Rockology, applicants

RECALCULATED USING REALISTIC PERCENT-RUNNOFF VALUES (CN)

ALL UNITS ARE C.F. (cubic ft) except %	% runoff (CN) used by Appl.	Appl's calc runoff volume	*Realistic % runoff (CN)*	*Difference in CN %*	*Recalc. volume with corrected CN*
pre-dev (veget'd soil)	82%	**338,218**	*75%*	*-7%*	***314,543***
post-dev (imperm. basalt)	84%	**360,482**	*95%*	*11%*	***400,135***
Difference between pre- and post-development is the minimum volume that must be retained by on-site pond.					
Applicant's volume:		**22,264**		***Realistic vol:***	***85,592***
Difference btwn calculated min vol's :				**63,328**	
Applicant's pond design (c.f.):				31,245	
POND LIKELY DEFICIENT BY AS MUCH AS:				***32,083***	cubic feet

Recalculation by K. Sorvig, Research Assoc. Professor, UNM School of Arch. & Planning
licensed Landscape Architect (ret.) in NM and PA by Uniform National Exam

PROPERTY LISTINGS SERVICES RESEARCH CENTER OUR PEOPLE ABOUT US CORPORATE RESPONSIBILITY INVESTOR RELATIONS CAREERS

La Bajada

Aggregates

BUILDOLOGY
CONSTRUCTION MATERIALS & DESIGN
3601 Pan American Freeway NE
Albuquerque NM 87107

October 10, 2003

Re: Waldo Aggregate Geology

Per your request, this is written to give a general description of the aggregates available and the anticipated physical properties of these materials on the lands owned by Waldo Aggregates, Partnership. It should be noted that this is based on my observations and study of the property, which has not yet included actual physical testing. Interested parties should conduct appropriate testing in order to determine actual physical properties and verify actual quantities of materials in place.

Within the approximate 11,000 acres, there are several geological formations containing significant quantities of construction aggregate resources. These include monzonite, rhyolite, pediment deposits, basalt, and outcrop sediments of the Santa Fe group.

1. Monzonite - currently being mined in the area, monzonite is a hard and durable material the meets all the properties to be used for construction purposes, including aggregate for hot mix asphalt, ready-mix concrete, base course railroad ballast, riprap and landscaping. These deposits will need to be quarried, requiring overburden removal, drilling, blasting, and crushing with large jaw and/or impact crushers for size reduction. Monzonite has a low Los Angeles abrasion property, resulting in normal to high wear costs in crushing and screening components.

2. Basalt - large deposits of basalt lie predominantly on the west side of the property. Although no formal testing has been done, visual observations and discussions with others indicates this material may also be used for construction aggregates. Visually the depth of material appears to be significant, ranging from 50'-100'. This, however, may be misleading, according to random drill tests performed by a contractor in this area, which indicated average material depths in the 20-255 range. Through selective exploration it is possible to establish durable quality aggregate in the flow rock. Ordinarily, the best rock is exposed near the edges of the flows.

3. Rhyolite - minor outcroppings of rhyolite exist. These sources are questionable in quality for construction aggregates, typically having a high Los Angeles abrasion loss, high soundness loss, and low specific gravity.

4. Santa Fe formation - as is the case with rhyolite, the Santa Fe formation will be of questionable quality for construction aggregates. Certain deposits may contain marginally acceptable physical properties for construction uses, however the marketability for this material will be primarily for landscaping ground cover.

5. Pediment deposits - fair quality pediment deposits occur within the property, cropping out in recent erosion channels. These deposits contain cobble rock and medium graded rock, mixed with igneous and sedimentary materials, with fair abrasive and soundness qualities. Selective subsurface exploration can develop pits suitable for primary construction jobs.

A summary of these materials and the expected range of physical properties:

L.A. Wear Sodium Soundness Specific Gravity Absorption

Monzonite	20-30%	10%	2.6-2.7	1.5%
Basalt	25-40%	5-20%	2.55-2.65	5%
Rhyolite	30-50%	10-25%	2.30-2.50	5%
Santa Fe	30-50%	10-25%	2.40-2.55	3%
Pediment	25-35%	5-20%	2.6-2.65	2%

From a quantitative perspective, the monzonite and basalt will most likely yield the greatest reserves. Using a conservative estimate of 20' depths, these materials will yield approximately 65,000 tons per acre. The other materials will yield approximately 45,000 tons per acre assuming 20' depths.

Again, please note that this information was derived from visual observations, general knowledge of the aggregates historically mined in the area, and state highway department information regarding aggregate resources. Actual field testing needs to be done to ensure quantitative and qualitative requirements are met.

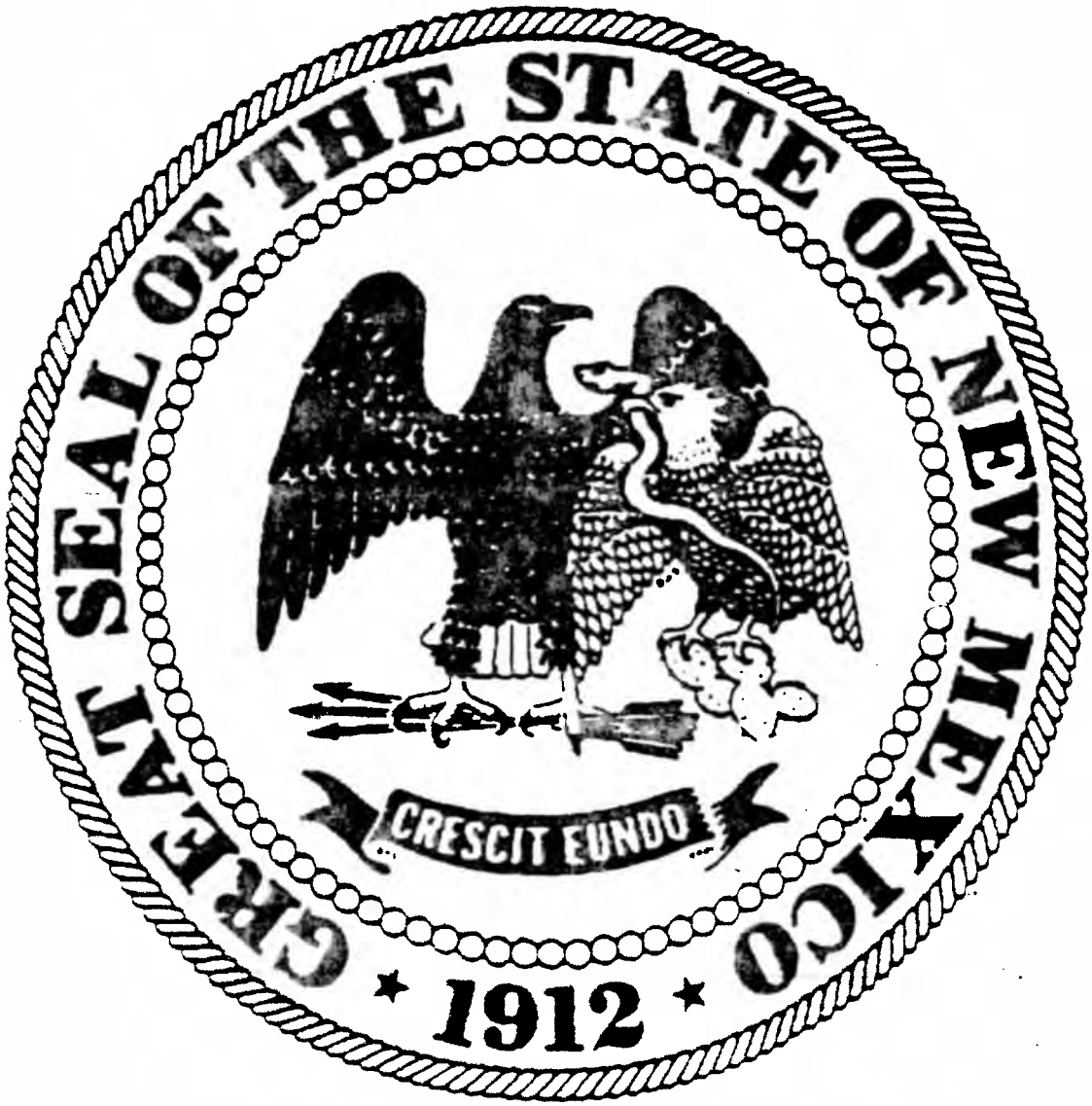
Please do not hesitate to contact me if you have any questions or comments.

Regards,

Steven A. Hooper, P.E.

Attachment #13: New Mexico Mining Act, 1993

NEW MEXICO



MINING ACT

ARTICLE 36
Mining

Section

69-36-1. Short title.

This act [69-36-1 to 69-36-20 NMSA 1978] may be cited as the "New Mexico Mining Act".

History: Laws 1993, ch. 315, § 1.

Cross references. — For regulation of lands affected by coal surface mining, see Chapter 69, Article 25A NMSA 1978.

ANNOTATION

County regulatory authority not preempted. — A county ordinance containing permit requirements for mines was not expressly or completely preempted by the New Mexico Mining Act or the adoption of regulations thereunder and, to the extent its ordinance did not conflict with the Act or the regulations, the county could require compliance therewith. San Pedro Mining Corp. v. Board of County Comm'rs, 1996-NMCA-002, 121 N.M. 194, 909 P.2d 754.

69-36-2. Purposes.

The purposes of the New Mexico Mining Act [69-36-1 to 69-36-20 NMSA 1978] include promoting responsible utilization and reclamation of lands affected by exploration, mining or the extraction of minerals that are vital to the welfare of New Mexico.

History: Laws 1993, ch. 315, § 2.

69-36-3. Definitions.

As used in the New Mexico Mining Act [69-36-1 to 69-36-20 NMSA 1978]:

A. "affected area" means the area outside of the permit area where the land surface, surface water, ground water and air resources are impacted by mining operations within the permit area;

B. "commission" means the mining commission established in the New Mexico Mining Act;

C. "director" means the director of the division or his designee;

D. "division" means the mining and minerals division of the energy, minerals and natural resources department;

E. "existing mining operation" means an extraction operation that produced marketable minerals for a total of at least two years between January 1, 1970 and the effective date of the New Mexico Mining Act;

F. "exploration" means the act of searching for or investigating a mineral deposit, including sinking shafts, tunneling, drilling core and bore holes, digging pits, making cuts and other works for the purpose of extracting samples prior to commencement of development or extraction operations and the building of roads, access ways and other facilities related to such work; however, activities that cause no, or very little, surface disturbance, such as airborne surveys and photographs, use of instruments or devices that are hand carried or otherwise transported over the surface to perform magnetic, radioactive or other tests and measurements, boundary or claim surveying, location work or other work that causes no greater disturbance than is caused by ordinary lawful use of the area by persons not engaged in exploration are excluded from the meaning of "exploration";

G. "mineral" means a nonliving commodity that is extracted from the earth for use or conversion into a saleable or usable product, but does not include clays, adobe, flagstone, potash, sand, gravel, caliche, borrow dirt, quarry rock used as aggregate for construction, coal, surfacewater or subsurfacewater, geothermal resources, oil and natural gas together with other chemicals recovered with them, commodities, byproduct materials and wastes that are regulated by the nuclear regulatory commission or waste regulated under Subtitle C of the federal Resource Conservation and Recovery Act;

H. "mining" means the process of obtaining useful minerals from the earth's crust or from previously disposed or abandoned mining wastes, including exploration, open-cut mining and surface operation, the disposal of refuse from underground and in situ mining, mineral transportation, concentrating, milling, evaporation, leaching and other processing. "Mining" does not mean the exploration and extraction of potash, sand, gravel, caliche, borrow dirt and quarry rock used as aggregate in construction, the exploration and extraction of natural petroleum in a liquid or gaseous state by means of wells or pipes, the development or extraction of coal, the extraction of geothermal resources, smelting, refining, cleaning, preparation, transportation or other off-site operations not conducted on permit areas or the extraction, processing or disposal of commodities, byproduct materials or wastes or other activities regulated by the federal nuclear regulatory commission;

I. "new mining operation" means a mining operation that engages in a development or extraction operation after the effective date of the New Mexico Mining

Act and that is not an existing mining operation;

J. "permit area" means the geographical area defined in the permit for a new mining operation or for an existing mining operation on which mining operations are conducted or cause disturbance; and

K. "reclamation" means the employment during and after a mining operation of measures designed to mitigate the disturbance of affected areas and permit areas and to the extent practicable, provide for the stabilization of a permit area following closure that will minimize future impact to the environment from the mining operation and protect air and water resources.

History: Laws 1993, ch. 315, § 3.

Effective date of the New Mexico Mining Act. — The effective date of the New Mexico Mining Act, referred to in Subsection E, is the effective date of Laws 1993, ch. 315, which is June 18, 1993.

Resource Conservation and Recovery Act. — The federal Resource Conservation and Recovery Act, referred to in Subsection G, is codified primarily as 42 U.S.C. § 6901 et seq.

ANNOTATION

Regulation defining "affected area". — A regulation changing the "and" to "or" in the statutory definition of "affected area" avoided an absurd interpretation since it must have been intended that such area be one where either the air, surface, water, ground water or land surface was impacted. Old Abe Co. v. New Mexico Mining Comm'n, 121 N.M. 83, 908 P.2d 776 (Ct. App. 1995).

"Mineral". — Uranium ore, at the time of its extraction from the earth by conventional mining techniques, is not regulated by the Nuclear Regulatory Commission and, therefore, meets the statutory definition of mineral in Subsection G, placing supervision of the mining sites under the supervision of the New Mexico mining commission. N.M. Mining Comm'n v. United Nuclear Corp., 2002-NMCA-108, 133 N.M. 8, 57 P.3d 862, cert. denied, N.M. , 57 P.3d 861 (2002).

New mining operation. — New Mexico mining commission acted within its discretion in ruling that the El Cajete mine was a new mining unit of the Las Conchas mine, rather than a new mining operation; the mines were owned by the same mining company and were substantially interrelated. Rio Grande Chapter of Sierra Club v. N.M. Mining Comm'n, 2003-NMSC-005, 133 N.M. 97, 61 P.3d 806.

69-36-4. Interim program; limitations.

A. Nothing in the New Mexico Mining Act [69-36-1 to 69-36-20 NMSA 1978] shall supersede current or future requirements and standards of any other applicable federal or state law.

B. After the effective date of the New Mexico Mining Act and until the commission adopts regulations necessary to carry out the provisions of the New Mexico Mining Act, county mining laws or ordinances shall apply to mining within their jurisdictions in New Mexico.

History: Laws 1993, ch. 315, § 4.

Effective date of the New Mexico Mining Act. — The effective date of the New Mexico Mining Act, referred to in Subsection B, is the effective date of Laws 1993, ch. 315, which is June 18,

1993.

ANNOTATION

County regulatory authority not preempted. — A county ordinance containing permit requirements for mines was not expressly or completely preempted by the New Mexico Mining Act or the adoption of regulations thereunder and, to the extent its ordinance did not conflict with the Act or the regulations, the county could require compliance therewith. San Pedro Mining Corp. v. Board of County Comm'rs, 1996-NMCA-002, 121 N.M. 194, 909 P.2d 754.

69-36-5. Mining operation site assessment.

A. After the effective date of the New Mexico Mining Act, the operator of a new mining operation may operate that new mining operation until the operator is either granted or denied a permit for a new mining operation provided that the operator submits to the director on or before June 30, 1994 a site assessment pursuant to the New Mexico Mining Act [69-36-1 to 69-36-20 NMSA 1978] or a notice of intent to close. On or before June 30, 1994, an existing mining operation shall submit to the director a site assessment pursuant to the New Mexico Mining Act.

B. The mining operation site assessment for new and existing mining operations shall describe in detail the mining operation's existing permits and regulatory requirements pursuant to the standards for mining operations pursuant to existing state and federal environmental standards and regulations. To the extent that they are applicable, the permit applicant may incorporate documents on file with state agencies. The mining operation site assessment shall include:

(1) identification of a proposed permit area for the mining operation;

(2) a description of the location and quality of surface and ground water at or adjacent to the mining operation and an analysis of the mining operation's impact on that surface and ground water;

(3) a description of the geologic regime beneath and adjacent to the mining operation;

(4) a description of the piles and other accumulations of waste, tailings and other materials and an analysis of their impact on the hydrologic balance, drainages and air quality;

(5) an analysis of the mining operation's impact on local communities;

(6) a description of wildlife and wildlife habitat at and surrounding the mining operation and an analysis of the mining operation's impact on that wildlife and wildlife habitat; and

(7) for existing mining operations, a description of the design limits for each unit, including waste units, impoundments and stockpiles and leach piles.

C. A new mining operation that files a notice of intent to close shall comply with the requirements for reclamation of new mining operations established in the New Mexico Mining Act and regulations adopted pursuant to that act.

D. The operator or owner of a new or existing mining operation or exploration shall

submit to the director, within thirty days of the effective date of the New Mexico Mining Act, written information stating the name and business address of the operator and owner of the new or existing mining operation or exploration, the address where official notices and other documents may be served and an agent for service of process. The operator or owner shall provide notification to the director of any change in the information required by this subsection. Updated information shall be provided promptly by the operator or owner to the director.

E. In lieu of a site assessment under this section, following adoption of the regulations, the operator or owner of an existing mining operation that has completed all reclamation measures may apply to the director for an inspection of the reclaimed areas to determine whether the completed reclamation satisfies the requirements of the New Mexico Mining Act and the substantive requirements for reclamation pursuant to the applicable regulatory standards. If the director determines that those requirements are met, the operator or owner shall be released from further requirements under the New Mexico Mining Act.

History: Laws 1993, ch. 315, § 5.

Cross references. — For regulation of lands affected by coal surface mining, see Chapter 69, Article 25A NMSA 1978.

Effective date of the New Mexico Mining Act. — The effective date of the New Mexico Mining Act, referred to in Subsections A and D, is the effective date of Laws 1993, ch. 315, which is June 18, 1993.

69-36-6. Mining commission; created; members.

A. The "mining commission" is created. The commission shall consist of seven voting members, including:

(1) the director of the bureau of geology and mineral resources of the New Mexico institute of mining and technology or his designee;

(2) the secretary of environment or his designee;

(3) the state engineer or his designee;

(4) the commissioner of public lands or his designee;

(5) the director of the department of game and fish or his designee; and

(6) two members of the public and an alternate for each, all to be appointed by the governor with the advice and consent of the senate. The public members shall be chosen to represent and to balance environmental and mining interests while minimizing conflicts of interest. No more than one of the public members and one of the alternates appointed may belong to the same political party. When the initial appointments are made, one of the public members and his alternate will be designated to serve for two-year terms, after which all public members shall serve for four years. An alternate member may vote only in the absence of the public member for whom he is the alternate.

B. The chairman of the soil and water conservation commission and the director of the agricultural experiment station of New Mexico state university or their designees shall be nonvoting members of the commission.

C. The commission shall elect a chairman and other necessary officers and keep

records of its proceedings.

D. The commission shall convene upon the call of the chairman or a majority of its members.

E. A majority of the voting members of the commission shall be a quorum for the transaction of business. However, no action of the commission shall be valid unless concurred upon by at least four of the members present.

F. No member of the commission, with the exception of one of the public members and his alternate, shall receive, or shall have received during the previous two years, more than ten percent of his income directly or indirectly from permit holders or applicants for permits. Each member of the commission shall, upon acceptance of his appointment and prior to the performance of any of his duties, file a statement of disclosure with the secretary of state stating:

(1) the amount of money or other valuable consideration received, whether provided directly or indirectly, from persons subject to or who appear before the commission;

(2) the identity of the source of money or other valuable consideration; and

(3) whether the money or other valuable consideration was in excess of ten percent of his gross personal income in either of the preceding two years.

G. No commissioner with any financial interest affected or potentially affected by a permit action may participate in proceedings related to that permit action.

History: Laws 1993, ch. 315, § 6; 1997, ch. 88, § 1; 2001, ch. 246, § 12.

The 1997 amendment, in Subsection A, substituted "his designee" for "an academic from a mining-related field to be appointed for a four-year term by the governor with the advice and consent of the senate" at the end of Paragraph (1); and, in Subsection B, substituted "members of" for "ex officio members to". Laws 1997, ch. 88 contains no effective date provision, but, pursuant to N.M. Const., art. IV, § 23, is effective on June 20, 1997, 90 days after adjournment of the legislature. See Volume 14 NMSA 1978 for "Adjournment Dates of Sessions of Legislature" table.

The 2001 amendment, effective June 15, 2001, in Paragraph A(1), substituted "bureau of geology" for "bureau of mines."

69-36-7. Commission; duties.

The commission shall:

A. before June 18, 1994, adopt and file reasonable regulations consistent with the purposes and intent of the New Mexico Mining Act [69-36-1 to 69-36-20 NMSA 1978] necessary to implement the provisions of the New Mexico Mining Act, including regulations that:

(1) consider the economic and environmental effects of their implementation;

(2) require permitting of all new and existing mining operations and exploration; and

(3) require annual reporting of production information to the commission, which shall be kept confidential if otherwise required by law;

B. adopt regulations for new mining operations that allow the director to select a qualified expert who may:

(1) review and comment to the director on the adequacy of baseline data gathered prior to submission of the permit application for use in the permit application process;

(2) recommend to the director additional baseline data that may be necessary in the review of the proposed mining activity;

(3) recommend to the director methodology guidelines to be followed in the collection of all baseline data; and

(4) review and comment on the permit application;

C. adopt regulations that require and provide for the issuance and renewal of permits for new and existing mining operations and exploration and that establish schedules to bring existing mining operations into compliance with the requirements of the New Mexico Mining Act; provided the term of a permit for a new mining operation shall not exceed twenty years and the term of renewals of permits for new mining operations shall not exceed ten years;

D. adopt regulations that provide for permit modifications. The commission shall establish criteria to determine which permit modifications may have significant environmental impact. Modifications that the director determines will have significant environmental impact shall require public notice and an opportunity for public hearing pursuant to Subsection K of this section. A permit modification to the permit for an existing mining operation shall be obtained for each new discrete processing, leaching, excavation, storage or stockpile unit located within the permit area of an existing mining operation and not identified in the permit of an existing mining operation and for each expansion of such a unit identified in the permit for an existing mining operation that exceeds the design limits specified in the permit. The regulations shall require that permit modifications for such units be approved if the director determines that the unit will:

(1) comply with the regulations regarding permit modifications;

(2) incorporate the requirements of Paragraphs (1), (2), (4), (5) and (6) of Subsection H of this section; and

(3) be sited and constructed in a manner that facilitates, to the maximum extent practicable, contemporaneous reclamation consistent with the closeout plan;

E. adopt regulations that require new and existing mining operations to obtain and maintain permits for standby status. A permit for standby status shall be issued for a maximum term of five years; provided that upon application the director may renew a permit for standby status for no more than three additional five-year terms. The regulations shall require that before a permit for standby status is issued or renewed an owner or operator shall:

(1) identify the projected term of standby status for each unit of the new or existing mining operation;

(2) take measures that reduce, to the extent practicable, the formation of acid and other toxic drainage to prevent releases that cause federal or state environmental standards to be exceeded;

(3) meet applicable federal and state environmental standards and regulations during the period of standby status;

(4) stabilize waste and storage units, leach piles, impoundments and pits during the term of standby status;

(5) comply with applicable requirements of the New Mexico Mining Act and the regulations adopted pursuant to that act; and

(6) provide an analysis of the economic viability of each unit proposed for standby status;

F. establish by regulation closeout plan requirements for existing mining operations that incorporate site-specific characteristics, including consideration of disturbances from previous mining operations, and that take into account the mining method utilized;

G. establish by regulation a procedure for the issuance of a permit for an existing mining operation and for modifications of that permit to incorporate approved closeout plans or portions of closeout plans and financial assurance requirements for performance of the closeout plans. The permit shall describe the permit area of the existing mining operation and the design limits of units of the existing mining operation based upon the site assessment submitted by the operator. The permit shall contain a schedule for completion of a closeout plan. The permit shall thereafter be modified to incorporate the approved closeout plan or portions of the closeout plan once financial assurance has been provided for completion of the closeout plan or the approved portions of the closeout plan. The permit may be modified for new mining units, expansions beyond the design limits of a unit at an existing mining operation or standby status;

H. establish by regulation permit and reclamation requirements for new mining operations that incorporate site-specific characteristics. These requirements shall, at a minimum:

(1) require that new mining operations be designed and operated using the most appropriate technology and the best management practices;

(2) assure protection of human health and safety, the environment, wildlife and domestic animals;

(3) include backfilling or partial backfilling only when necessary to achieve reclamation objectives that cannot be accomplished through other mitigation measures;

(4) require approval by the director that the permit area will achieve a self-sustaining ecosystem appropriate for the life zone of the surrounding areas following closure unless conflicting with the approved post-mining land use;

(5) require that new mining operations be designed in a manner that incorporates measures to reduce, to the extent practicable, the formation of acid and other toxic drainage that may otherwise occur following closure to prevent releases that cause federal or state standards to be exceeded;

(6) require that nonpoint source surface releases of acid or other toxic substances shall be contained within the permit area;

(7) require that all waste, waste management units, pits, heaps, pads and any

other storage piles are designed, sited and constructed in a manner that facilitates, to the maximum extent practicable, contemporaneous reclamation and are consistent with the new mining operation's approved reclamation plan; and

(8) where sufficient topsoil is present, take measures to preserve it from erosion or contamination and assure that it is in a usable condition for sustaining vegetation when needed;

I. adopt regulations that establish a permit application process for new mining operations that includes:

(1) disclosure of ownership and controlling interests in the new mining operation or submission of the applicant's most recent form 10K required by the federal securities exchange commission;

(2) a statement of all mining operations within the United States owned, operated or directly controlled by the applicant, owner or operator and by persons or entities that directly control the applicant and the names and the addresses of regulatory agencies with jurisdiction over the environmental aspects of those operations and [sic] that could provide a compliance history for those operations and over the preceding ten years. The operator shall assist the applicant in obtaining compliance history information;

(3) a description of the type and method of mining and the engineering techniques proposed;

(4) the anticipated starting and termination dates of each phase of the new mining operation and the number of acres of land to be affected;

(5) the names of all affected watersheds, the location of any perennial, ephemeral or intermittent surface stream or tributary into which surface or pit drainage will be discharged or may possibly be expected to reach and the location of any spring within the permit area and the affected area;

(6) a determination of the probable hydrologic consequences of the new mining operation and reclamation, both on and off the permit area, with respect to the hydrologic regime, quantity and quality of surface and ground water systems, including the dissolved and suspended solids under seasonal flow conditions;

(7) cross-sections or plans of the permit area depicting:

(a) the nature and depth of the various formations of overburden;

(b) the location of subsurface water, if encountered, and its quality;

(c) the nature and location of any ore body to be mined;

(d) the location of aquifers and springs;

(e) the estimated position and flow of the water table;

(f) the proposed location of waste rock, tailings, stockpiles, heaps, pads and topsoil preservation areas; and

(g) premining vegetation and wildlife habitat features present at the site;

(8) the potential for geochemical alteration of overburden, the ore body and other materials present within the permit area;

(9) a reclamation plan that includes a detailed description of the proposed post-mining land use and how that use is to be achieved; and

(10) premining baseline data as required by regulations adopted by the commission;

J. adopt regulations to coordinate the roles of permitting agencies involved in regulating activities related to new and existing mining operations and exploration, including regulatory requirements, to avoid duplicative and conflicting administration of the permitting process and other requirements;

K. except for regulations enacted pursuant to Subsection L of this section, adopt regulations that ensure that the public and permitting agencies receive notice of each application for issuance, renewal or revision of a permit for a new or existing mining operation, for standby status, or exploration, a variance or an application for release of financial assurance and any inspection prior to the release of financial assurance, including a provision that no action shall be taken on any application until an opportunity for a public hearing, held in the locality of the operation, is provided and that all interested persons shall be given a reasonable chance to submit data, views or arguments orally or in writing and to examine witnesses testifying at the hearing. An additional opportunity for a public hearing may be provided if the applicant makes substantial changes in the proposed action, if there are significant new circumstances or information bearing on the proposed action or if the applicant proposes to substantially increase the scale or substantially change the nature of the proposed action and there is public interest and a request for a public hearing. These regulations shall require at a minimum that the applicant for issuance, renewal or revisions of a permit or a variance or an application for release of financial assurance and any inspection prior to release of financial assurance shall provide to the director at the time of filing the application with the director proof that notice of the application and of the procedure for requesting a public hearing has been:

(1) provided by certified mail to the owners of record, as shown by the most recent property tax schedule, of all properties within one-half mile of the property on which the mining operation is located or is proposed to be located;

(2) provided by certified mail to all municipalities and counties within a ten-mile radius of the property on which the mining operation is or will be located;

(3) published once in a newspaper of general circulation in each county in which the property on which the mining operation is or will be located; provided that this notice shall appear in either the classified or legal advertisements section of the newspaper and at one other place in the newspaper calculated to give the general public the most effective notice and, when appropriate, shall be printed in both English and Spanish;

(4) posted in at least four publicly accessible and conspicuous places, including the entrance to the new or existing mining operation if that entrance is publicly accessible and conspicuous;

(5) mailed to all persons who have made a written request to the director for notice of this application; and

(6) mailed by certified mail to all persons on a list maintained by the director

of individuals and organizations who have requested notice of applications under this act [New Mexico Mining Act]. If the application is determined to be administratively complete by the director, the applicant shall provide to the director timely proof that notice of that determination has been provided by first class mail to everyone who has indicated to the applicant in writing that they desire information regarding the application and to a list maintained by the director of individuals and organizations who have requested notice of applications under this act;

L. adopt regulations to provide for permits, without notice and hearing, to address mining operations that have minimal impact on the environment; provided that such permits shall require general plans and shall otherwise reduce the permitting requirements of the New Mexico Mining Act;

M. establish by regulation a schedule of annual administrative and permit fees, which shall equal and not exceed the estimated costs of administration, implementation, enforcement, investigation and permitting pursuant to the provisions of the New Mexico Mining Act. The size of the operation, anticipated inspection frequency and other factors deemed relevant by the commission shall be considered in the determination of the fees. The fees established pursuant to this subsection shall be deposited in the mining act fund;

N. establish by regulation a continuing process of review of mining and reclamation practices in New Mexico that provides for periodic review and amendment of regulations and procedures to provide for the protection of the environment and consider the economic effects of the regulations;

O. adopt regulations governing the provision of variances issued by the director, stating the procedures for seeking a variance, including provisions for public notice and an opportunity for a hearing in the locality where the variance will be operative, the limitations on provision of variances, requiring the petitioner to present sufficient evidence to prove that failure to grant a variance will impose an undue economic burden and that granting the variance will not result in a significant threat to human health, safety or the environment;

P. provide by regulation that, prior to the issuance of any permit for a new mining operation pursuant to the provisions of the New Mexico Mining Act, the permit applicant or operator:

(1) shall provide evidence to the director that other applicable state and federal permits required to be obtained by the new or existing mining operation either have been or will be issued before the activities subject to those permits begin; and

(2) shall provide to the director a written determination from the secretary of environment stating that the permit applicant has demonstrated that the activities to be permitted or authorized will be expected to achieve compliance with all applicable air, water quality and other environmental standards if carried out as described;

Q. require by regulation that the applicant file with the director, prior to the issuance of a permit, financial assurance. The amount of the financial assurance shall be sufficient to assure the completion of the performance requirements of the permit, including closure and reclamation, if the work had to be performed by the director or a third party contractor and shall include periodic review to account for any inflationary

increases and anticipated changes in reclamation or closure costs. The regulations shall specify that financial requirements shall neither duplicate nor be less comprehensive than the federal financial requirements. The form and amount of the financial assurance shall be subject to the approval of the director as part of the permit application; provided, financial assurance does not include any type or variety of self-guarantee or self-insurance;

R. require by regulation that the permittee may file an application with the director for the release of all or part of the permittee's financial assurance. The permittee shall not file an application for release of financial assurance more than once per year for each mining operation. The application shall describe the reclamation measures completed and shall contain an estimate of the costs of reclamation measures that have not been completed. Prior to release of any portion of the permittee's financial assurance, the director shall conduct an inspection and evaluation of the reclamation work involved. The director shall notify persons who have requested advance notice of the inspection. Interested members of the public shall be allowed to be present at the inspection of the reclamation work by the director.

(1) The director may release in whole or in part the financial assurance if the reclamation covered by the financial assurance has been accomplished as required by the New Mexico Mining Act; provided that the director shall retain financial assurance at least equal to the approved estimated costs of completing reclamation measures that have not been completed; and provided further that for revegetated areas, the director shall retain the amount of financial assurance necessary for a third party to reestablish vegetation for a period of twelve years after the last year of augmented seeding, fertilizing, irrigation or other work, unless a post-mining land use is achieved that is inconsistent with the further need for revegetation. For new mining operations only, no part of the financial assurance necessary for a third party to reestablish vegetation shall be released so long as the lands to which the release would be applicable are contributing suspended solids above background levels to streamflow of intermittent and perennial streams.

(2) A person with an interest that is or will be adversely affected by release of the financial assurance may file, with the director within thirty days of the date of the inspection, written objections to the proposed release from financial assurance. If written objections are filed and a hearing is requested, the director shall inform all the interested parties of the time and place of the hearing at least thirty days in advance of the public hearing, and hold a public hearing in the locality of the new or existing mining operation or exploration operation proposed for release from financial assurance. The date, time and location of the public hearing shall be advertised by the director in a newspaper of general circulation in the locality for two consecutive weeks, and all persons who have submitted a written request in advance to the director to receive notices of hearings shall be provided notice at least thirty days prior to the hearing;

S. establish coordinated procedures that avoid duplication for the inspection, monitoring and sampling of air, soil and water and enforcement of applicable requirements of the New Mexico Mining Act, regulations adopted pursuant to that act and permit conditions for new and existing mining operations and exploration. The regulations shall require, at a minimum:

(1) inspections by the director occurring on an irregular basis according to the following schedule:

(a) at least one inspection per month when the mining operation is conducting significant reclamation activities;

(b) at least two inspections per year for active mining operations;

(c) at least one inspection per year on inactive sites;

(d) at least one inspection per year following completion of all significant reclamation activities, but prior to release of financial assurance; and

(e) mining operations having a minimal impact on the environment and exploration operations will be inspected on a schedule to be established by the commission;

(2) inspections shall occur without prior notice to the permittee or his agents or employees except for necessary on-site meetings with the permittee;

(3) when the director determines that a condition or practice exists that violates a requirement of the New Mexico Mining Act, a regulation adopted pursuant to that act or a permit issued under that act, which condition, practice or violation also creates an imminent danger to the health or safety of the public or will cause significant imminent environmental harm, the director shall immediately order a cessation of the new or existing mining operation or the exploration operation or the portion of that operation relevant to the condition, practice or violation. The cessation order shall remain in effect until the director determines that the condition, practice or violation has been abated or until modified, vacated or terminated by the director or the commission;

(4) when the director determines that an owner or operator is in violation of a requirement of the New Mexico Mining Act, a regulation adopted pursuant to that act or a permit issued pursuant to that act but the violation does not create an imminent danger to the health or safety of the public or will not cause significant imminent environmental harm, the director shall issue a notice to the owner or operator fixing a reasonable time, not to exceed sixty days, for the abatement of the violation. If, upon expiration of the period of time as originally fixed or subsequently extended for good cause shown, the director finds that the violation has not been abated, he shall immediately order a cessation of new or existing mining operations or exploration operations or the portion thereof relevant to the violation. The cessation order shall remain in effect until the director determines that the violation has been abated; and

(5) when the director determines that a pattern of violations of the requirements of the New Mexico Mining Act or of the regulations adopted pursuant to that act or the permit required by that act exists or has existed and, if the director also finds that such violations are caused by the unwarranted failure of the owner or operator to comply with the requirements of that act, regulation or permit or that such violations are willfully caused by the owner or operator, the director shall immediately issue an order to the owner or operator to show cause as to why the permit should not be suspended or revoked;

T. provide for the transfer of a permit to a successor operator, providing for release of the first operator from obligations under the permit, including financial

assurance, following the approved assumption of such obligations and financial assurance by the successor operator;

U. adopt regulations providing that the owner or operator of an existing mining operation or a new mining operation who has completed some reclamation measures prior to the effective date of the regulations adopted pursuant to the New Mexico Mining Act may apply for an inspection of those reclamation measures and a release from further requirements pursuant to that act for the reclaimed areas if, after an inspection, the director determines that the reclamation measures satisfy the requirements of that act and the substantive requirements for reclamation pursuant to the applicable regulatory standards; and

V. develop and adopt other regulations necessary and appropriate to carry out the purposes and provisions of the New Mexico Mining Act.

History: Laws 1993, ch. 315, § 7; 1997, ch. 88, § 2.

Bracketed material. — The bracketed material in Subsections I(2) and K(6) was inserted by the compiler; the bracketed material was not enacted by the legislature and is not a part of the law.

The 1997 amendment, in the introductory language of Subsection A, substituted "before June 18, 1994" for "within one year of the effective date of the New Mexico Mining Act" at the beginning and "the provisions of the New Mexico Mining Act" for "that Act" near the end; in Subsection K, in the introductory language, added the second sentence and inserted "at the time of the filing of the application with the director" and "and of the procedure for requesting a public hearing" in the last sentence, made a minor stylistic change in Paragraph (4), added "of this application; and" in Paragraph (5), and added Paragraph (6); and, in Subsection S, rewrote Paragraph (1). Laws 1997, ch. 88 contains no effective date provision, but, pursuant to N.M. Const., art. IV, § 23, is effective on June 20, 1997, 90 days after adjournment of the legislature. See Volume 14 NMSA 1978 for "Adjournment Dates of Sessions of Legislature" table.

ANNOTATION

Constitutionality of regulations. — Regulations that did not establish a schedule of fees but provided that almost all fees be set on a case-by-case basis were invalid insofar as they did not set a determinate fee. Old Abe Co. v. New Mexico Mining Comm'n, 121 N.M. 83, 908 P.2d 776 (Ct. App. 1995).

Regulations were not impermissibly vague and could not delegate an unbridled discretion in the director, in view of the provisions for both administrative and judicial review of actions of the director, and therefore did not violate due process. Old Abe Co. v. New Mexico Mining Comm'n, 121 N.M. 83, 908 P.2d 776 (Ct. App. 1995).

Regulations granting power to the director, an employee of the commission, were not violative of the separation of powers doctrine. Old Abe Co. v. New Mexico Mining Comm'n, 121 N.M. 83, 908 P.2d 776 (Ct. App. 1995).

The provision authorizing the imposition of fees by the commission did not violate the constitutional prohibition against the imposition of fees by a nonelective body, since the commission is not a political subdivision. Old Abe Co. v. New Mexico Mining Comm'n, 121 N.M. 83, 908 P.2d 776 (Ct. App. 1995).

A definition of "mining" that classified mining operations into different categories did not violate the dictates of equal protection. Old Abe Co. v. New Mexico Mining Comm'n, 121 N.M. 83, 908 P.2d 776 (Ct. App. 1995).

Rulemaking authority. — The commission had authority to adopt a rule imposing a surcharge on certain fees promulgated by it in order to partially reimburse the Department of Game and Fish for assistance in implementing the State Mining Act. New Mexico Mining Ass'n v. New Mexico Mining Comm'n, 1996-NMCA-098, 122 N.M. 332, 924 P.2d 741.

Fee not a tax. — A surcharge imposed on certain fees for the purpose of reimbursing the Department of Game and Fish for assisting in implementing the State Mining Act was a fee, not a tax. New Mexico Mining Ass'n v. New Mexico Mining Comm'n, 1996-NMCA-098, 122 N.M. 332, 924 P.2d 741.

Transfer of funds. — Nothing in the Mining Act, the Wildlife Conservation Act (17-2-37 to 17-2-46 NMSA 1978), or other state laws prohibit the transfer of funds derived from fees imposed by the commission to the Department of Fish and Game to assist in implementing the Mining Act. New Mexico Mining Ass'n v. New Mexico Mining Comm'n, 1996-NMCA-098, 122 N.M. 332, 924 P.2d 741.

Discretion. — New Mexico mining commission acted within its discretion in ruling that the El Cajete mine was a new mining unit of the Las Conchas mine, rather than a new mining operation; the mines were owned by the same mining company and were substantially interrelated. Rio Grande Chapter of Sierra Club v. N.M. Mining Comm'n, 2003-NMSC-005, 133 N.M. 97, 61 P.3d 806.

69-36-8. Regulations; adoption process.

A. No regulation shall be adopted, amended or repealed without a public hearing before the commission or a hearing officer appointed by the commission.

B. Any person may recommend or propose regulations to the commission for adoption, amendment or repeal. The commission shall determine within sixty days of submission of a proposed regulation whether to hold a hearing. If the commission determines not to hold a hearing, the determination shall be subject to review under Section 16 of the New Mexico Mining Act [69-36-16 NMSA 1978].

C. The public hearing shall be held in Santa Fe, and a verbatim record shall be maintained of all proceedings. Notice of the subject, time and place of the hearing, the manner in which interested persons may present their views and the method by which copies of the proposed regulation or amendment may be obtained shall be:

(1) published at least thirty days prior to the hearing date in a newspaper of general circulation in the state and in the New Mexico register, if published; and

(2) mailed at least thirty days prior to the hearing date to all persons who have made a written request to the commission for advance notice of hearings.

D. The commission shall allow all interested persons a reasonable opportunity to submit arguments and to examine witnesses testifying at the hearing.

E. A person appearing or represented at the hearing shall, upon a written request, be given written notice of the commission's action on the proposed adoption, amendment or repeal of regulation.

F. No regulation, its amendment or repeal shall be effective except as provided by the Public Records Act [Chapter 14, Article 3 NMSA 1978].

History: Laws 1993, ch. 315, § 8.

Cross references. — For regulation of lands affected by coal surface mining, see Chapter 69,

Article 25A NMSA 1978.

69-36-9. Director; duties.

The director shall:

A. exercise all powers of enforcement and administration arising under the New Mexico Mining Act [69-36-1 to 69-36-20 NMSA 1978] not otherwise expressly delegated to the commission, execute and administer the commission's regulations and coordinate the review and issuance of permits for new and existing mining operations and exploration with all other state or federal permit processes applicable to the proposed operations;

B. enter into agreements with appropriate federal and state agencies for coordinating the review and issuance of all necessary permits to conduct new and existing mining operations and exploration in New Mexico;

C. create an advisory committee, the membership of which shall balance the interests of affected government entities, the mining industry, environmental groups, regulatory agencies and other persons as determined by the director to represent a constituency that will be affected by the provisions of the New Mexico Mining Act;

D. confer and cooperate with the secretary of environment in administering the New Mexico Mining Act, in developing proposed regulations and obtain the concurrence of the secretary of environment regarding areas of the regulations that have an impact upon programs administered by the department of environment;

E. approve a permit area and design limits for new and existing mining operations and exploration following submission of the site assessment, where applicable and prior to issuing a permit. The director shall incorporate the permit area and design limits into the permit issued;

F. review at least twelve months of baseline data and other information submitted by the applicant for a permit for a new mining operation, before the permit is approved or denied; and

G. prepare an environmental evaluation, before a permit for a new mining operation is approved or denied, which shall include an analysis of the reasonably foreseeable impacts of proposed activities on the premining and post-mining environment and the local community, including other past, present and reasonably foreseeable future actions, regardless of the agency or persons that undertake the other action or whether the actions are on private, state or federal land. The director may contract with, and the applicant shall pay for, a third party to prepare the analysis and assessment.

History: Laws 1993, ch. 315, § 9.

69-36-10. Confidentiality.

If the operator designates as confidential an exploration map, financial information, information concerning the grade or location of ore reserves or trade secret information, the director shall maintain the information as confidential and not subject to public records or disclosure laws; provided that if a request is made for public review of the information, the director shall notify the operator and provide a reasonable opportunity

for substantiation of the claim that public disclosure of the information could harm the competitive position of the operator. If the claim of confidentiality is not substantiated to the satisfaction of the director, the information shall be released.

History: Laws 1993, ch. 315, § 10.

69-36-11. Existing mining operations; closeout plan required.

A. An owner or operator of an existing mining operation shall submit a permit application to the director by December 31, 1994. The permit application shall contain all information required by regulation of the commission, including a proposed compliance schedule for submission of a closeout plan within the shortest time practicable. The director shall approve or deny the permit application within six months after it has been deemed complete.

B. The owner or operator of an existing mining operation shall submit a closeout plan in accordance with the compliance schedule in the permit. The compliance schedule in the permit shall require submission of a closeout plan by December 31, 1995 unless the operator shows good cause for a further extension of time. The director shall approve a modification of a permit for an existing mining operation incorporating a closeout plan or portion of a closeout plan if:

(1) the closeout plan and permit application is complete;

(2) the closeout plan permit fee has been paid and the financial assurance is adequate and has been provided;

(3) the closeout plan specifies incremental work to be done within specific time frames that, if followed, will reclaim the physical environment of the permit area to a condition that allows for the reestablishment of a self-sustaining ecosystem on the permit area following closure, appropriate for the life zone of the surrounding areas unless conflicting with the approved post-mining land use; provided that for purposes of this section, upon a showing that achieving a post-mining land use or self-sustaining ecosystem is not technically or economically feasible or is environmentally unsound, the director may waive the requirement to achieve a self-sustaining ecosystem or post-mining land use for an open pit or waste unit if measures will be taken to ensure that the open pit or waste unit will meet all applicable federal and state laws, regulations and standards for air, surfacewater and ground water protection following closure and will not pose a current or future hazard to public health or safety; and

(4) the secretary of environment has provided a written determination in the form prescribed in Paragraph (2) of Subsection P of Section 7 of the New Mexico Mining Act [69-36-7 NMSA 1978].

C. An approval granted pursuant to this section may be revoked or suspended by order of the director for violation of a provision of the approved closeout plan or permit for the existing mining operation, an approval condition, a regulation of the commission or a provision of the New Mexico Mining Act [69-36-1 to 69-36-20 NMSA 1978].

History: Laws 1993, ch. 315, § 11.

Cross references. — For regulation of lands affected by coal surface mining, see Chapter 69, Article 25A NMSA 1978.

69-36-12. New mining operations; mining operation permit required.

A. After the effective date of the New Mexico Mining Act, except as provided in Section 5 [69-36-5 NMSA 1978] of that act, no person shall conduct a new mining operation without a permit issued by the director. Applications for permits for new mining operations operating pursuant to Section 5 of the New Mexico Mining Act shall be received by the director by December 31, 1995. The director may grant one extension for the submission of a permit application for a new mining operation for six months for good cause shown. Prior to receiving a permit for a new mining operation, an applicant shall submit an application that complies with the New Mexico Mining Act [69-36-1 to 69-36-20 NMSA 1978] and regulation of the commission, including at a minimum, one year of baseline data as required by regulation.

B. The director shall issue the permit for a new mining operation if the director finds that:

(1) the permit application is complete;

(2) the permit application fee has been paid and the financial assurance is adequate and has been provided;

(3) reclamation in accordance with the proposed reclamation plan is economically and technically feasible;

(4) the mining operation is designed to meet without perpetual care all applicable environmental requirements imposed by the New Mexico Mining Act and regulations adopted pursuant to that act and other laws following closure; and

(5) the applicant, the operator or owner or any persons or entities directly controlled by the applicant, operator, owner or any persons or entities that directly control the applicant, operator or owner:

(a) are not currently in violation of the terms of another permit issued by the division or in violation of any substantial environmental law or substantive environmental regulation at a mining operation in the United States, which violation is unabated and is not the subject of appeal, and have not forfeited or had forfeited financial assurance required for any mining, reclamation or exploration permit in the United States; provided that a violation that occurred prior to the initiation of a legal relationship between the permit applicant and the violator shall not be considered for purposes of this paragraph; and

(b) have not demonstrated a pattern of willful violations of the New Mexico Mining Act or other New Mexico environmental statutes; provided that a violation that occurred prior to the initiation of a legal relationship between the permit applicant and the violator shall not be considered for purposes of this paragraph.

C. The permit for a new mining operation may be revoked or suspended by order of the director for violation of its terms or conditions, a regulation of the commission or a provision of the New Mexico Mining Act.

History: Laws 1993, ch. 315, § 12.

Cross references. — For regulation of lands affected by coal surface mining, see Chapter 69, Article 25A NMSA 1978.

Effective date of the New Mexico Mining Act. — The effective date of the New Mexico Mining

Act, referred to in Subsection A, is the effective date of Laws 1993, ch. 315, which is June 18, 1993.

69-36-13. Exploration permit.

A. After December 31, 1994, a person shall not engage in exploration operations in New Mexico without first obtaining a permit to conduct exploration from the director. In order to be approved by December 31, 1994, the application for a permit to conduct exploration shall be submitted by September 1, 1994. A permit to conduct exploration shall not be issued for a period of more than one year from the date of issue and is renewable from year to year upon application. An application for renewal of a permit to conduct exploration shall be filed within thirty days preceding the expiration of the current permit. A permit to conduct exploration shall not be renewed if the applicant for renewal is in violation of any provision of the New Mexico Mining Act [69-36-1 to 69-36-20 NMSA 1978].

B. A person shall not be issued a permit to conduct exploration if that person's failure to comply with the provisions of the New Mexico Mining Act, the regulations adopted pursuant to that act or a permit issued under that act has resulted in the forfeiture of financial assurance.

C. An applicant for a permit to conduct exploration shall not be issued a permit to conduct exploration until he:

(1) pays a permit fee for exploration;

(2) agrees to reclaim any surface area damaged by the applicant during exploration operations in accordance with a reclamation plan submitted to and approved by the director; and

(3) certifies that he is not in violation of any other obligation under the New Mexico Mining Act or the regulations adopted pursuant to that act.

D. The application for a permit to conduct exploration shall include an exploration map in sufficient detail to locate the area to be explored and to determine whether environmental problems would be encountered. The commission shall establish regulations to determine the precise nature of and requirements for the exploration map. The application shall state what type of exploration and excavation techniques will be employed in disturbing the land during exploration operations.

E. Prior to the issuance of a permit to conduct exploration, the applicant shall provide to the division financial assurance in a form and amount as determined by the director pursuant to Section 7 [69-36-7 NMSA 1978] of the New Mexico Mining Act. The financial assurance shall be released only in accordance with the provisions of that act.

F. In the event that the holder of a permit to conduct exploration desires to mine the permit area to conduct exploration and he has fulfilled all of the requirements for a permit for new mining operations, the director shall allow postponement of the reclamation of the acreage explored if that acreage is incorporated into the complete reclamation plan submitted with the application for a permit for a new mining operation. Land affected by exploration or excavation under a permit for exploration and not covered by the reclamation plan shall be reclaimed in a manner acceptable to the director within two

years after the completion of exploration or abandonment of the site.

History: Laws 1993, ch. 315, § 13.

Cross references. — For regulation of lands affected by coal surface mining, see Chapter 69, Article 25A NMSA 1978.

69-36-14. Citizens suits.

A. A person having an interest that is or may be adversely affected may commence a civil action on his own behalf to compel compliance with the New Mexico Mining Act [69-36-1 to 69-36-20 NMSA 1978]. Such action may be brought against:

(1) the department of environment, the energy, minerals and natural resources department or the commission alleging a violation of the New Mexico Mining Act or of a rule, regulation, order or permit issued pursuant to that act;

(2) a person who is alleged to be in violation of a rule, regulation, order or permit issued pursuant to the New Mexico Mining Act; or

(3) the department of environment, the energy, minerals and natural resources department or the commission alleging a failure to perform any nondiscretionary act or duty required by the New Mexico Mining Act; provided, however, that no action pursuant to this section shall be commenced if the department of environment, the energy, minerals and natural resources department or the commission has commenced and is diligently prosecuting a civil action in a court of this state or an administrative enforcement proceeding to require compliance with that act. In an administrative or court action commenced by the department of environment, the energy, minerals and natural resources department or the commission, a person whose interest may be adversely affected and who has provided notice pursuant to Subsection B of this section prior to the initiation of the action may intervene as a matter of right.

B. No action shall be commenced pursuant to this section prior to sixty days after the plaintiff has given written notice to the department of environment, the energy, minerals and natural resources department, the commission, the attorney general and the alleged violator of the New Mexico Mining Act; provided, however, when the violation or order complained of constitutes an immediate threat to the health or safety of the plaintiff or would immediately and irreversibly impair a legal interest of the plaintiff, an action pursuant to this section may be brought immediately after notification of the proper parties.

C. Except as otherwise provided herein, suits against the department of environment, the energy, minerals and natural resources department or the commission shall be brought in the district court of Santa Fe county. Suits only against one or more owners or operators of one or more mining operations shall be brought in the district court where one of the mining operations is located. If an action is brought against the department of environment, the energy, minerals and natural resources department or the commission and the owner or operator of a mining operation, such owner or operator may apply for a change of venue to the judicial district in which the mining operation is located. If not already a party, an owner or operator may intervene, upon a showing that the action relates primarily to a dispute regarding the single mining operation and apply for such a change of venue. The district court shall grant a change of venue upon a showing that the

action relates primarily to a dispute regarding the subject single mining operation and a showing that a forum non conveniens analysis suggests that the location of the mining operation is a superior venue.

D. In an action brought pursuant to this section, the department of environment, the energy, minerals and natural resources department or the commission, if not a party, may intervene.

E. The court, in issuing a final order in an action brought pursuant to this section, may award costs of litigation, including attorney and expert witness fees, to a party whenever the court determines such award is appropriate. The court may, if a temporary injunction or preliminary injunction is sought, require the filing of a bond or equivalent security in accordance with the rules of civil procedure.

History: Laws 1993, ch. 315, § 14; 1997, ch. 88, § 3.

The 1997 amendment, in Subsection A, substituted "duty required by" for "duty under" in the first sentence in Paragraph (3); rewrote Subsection C; and, in Subsection E, substituted "attorney" for "attorneys". Laws 1997, ch. 88 contains no effective date provision, but, pursuant to N.M. Const., art. IV, § 23, is effective on June 20, 1997, 90 days after adjournment of the legislature. See Volume 14 NMSA 1978 for "Adjournment Dates of Sessions of Legislature" table.

ANNOTATION

Administrative review. — A challenge to the issuance of a permit must pursue an administrative review under 69-36-15 NMSA 1978 before proceeding with a "citizen suit" under this section. Pueblo of Picuris v. New Mexico Energy, Minerals & Natural Resources Dep't, 2001-NMCA-084, 131 N.M. 166, 33 P.3d 916, cert. denied, 131 N.M. 221, 34 P.3d 610 (2002).

Am. Jur. 2d, A.L.R. and C.J.S. references. — Requirement that there be continuing violation to maintain citizen suit under federal environmental protection statutes - post-*Gwaltney* cases, 158 A.L.R. Fed. 519.

69-36-15. Administrative review.

A. Any order, penalty assessment or issuance or denial of a permit by the director pursuant to the New Mexico Mining Act [69-36-1 to 69-36-20 NMSA 1978] shall become final unless a person who is or may be adversely affected by the order, penalty assessment or issuance or denial of a permit files, within sixty days from the date of notice of the order, penalty assessment or issuance or denial of a permit, a written petition to the commission for review of the order, penalty assessment or issuance or denial of a permit by the director.

B. The commission shall set a hearing no sooner than thirty days and no later than sixty days from the date of receipt of the petition.

C. Evidence in support of, or to challenge, the action of the director shall be heard by the commission or by a hearing officer appointed by the commission.

D. A verbatim record of the hearing shall be made and preserved by the commission or the hearing officer.

E. A recommendation based on the record shall be made by the hearing officer and presented to the commission. The commission shall issue findings of fact and a final

decision in the proceedings.

F. The chairman of the commission may issue subpoenas to compel attendance of witnesses and for documents relevant to the action to be heard before the commission. The Rules of Civil Procedure for the District Courts shall govern discovery procedures in commission hearings.

History: Laws 1993, ch. 315, § 15.

ANNOTATION

Administrative review. — A challenge to the issuance of a permit must pursue an administrative review under this section before proceeding with a "citizen suit" under 69-36-14 NMSA 1978. Pueblo of Picuris v. New Mexico Energy, Minerals & Natural Resources Dep't, 2001-NMCA-084, 131 N.M. 166, 33 P.3d 916, cert. denied, 131 N.M. 221, 34 P.3d 610 (2002).

69-36-16. Judicial review.

A. A person who is or may be affected by a rule of the commission may appeal the action of the commission by filing a notice of appeal with the court of appeals within thirty days from the filing date of the rule with the state records center. All appeals of rules shall be taken on the record made at the public hearing on the rule.

B. A party, intervenor or any other person upon a showing of good cause for not appearing at the public hearing on a rule may appeal a decision of the commission adopting, amending or repealing the rule by filing a written notice of appeal with the court of appeals within forty-five days after entry of the commission's decision. Copies of the notice of appeal shall be served at the time of filing, either personally or by certified mail, upon all parties to the proceeding before the commission.

C. A person who is or may be affected by a final action of the commission other than a rule may appeal the action of the commission by filing a notice of appeal with the district court pursuant to the provisions of Section 39-3-1.1 NMSA 1978.

History: Laws 1993, ch. 315, § 16; 1998, ch. 55, § 84; 1999, ch. 265, § 86.

Cross references. — For procedures governing administrative appeals to the district court, see Rule 1-074 NMRA.

The 1998 amendment, effective September 1, 1998, substituted "rule" for "regulation" and "rules" for "regulations" throughout the section; rewrote Subsection C; deleted former Subsections D through F relating to procedures on appeal; and made minor stylistic changes throughout the section.

The 1999 amendment, effective July 1, 1999, substituted "Section 39-3-1.1" for "Section 12-8A-1" in Subsection C.

Compiler's notes. — For scope of review of the district court, see *Zamora v. Village of Ruidoso Downs,* 120 N.M. 778, 907 P.2d 182 (1995).

ANNOTATION

Authority of court of appeals. — Even though the commission had taken no action against miners under the challenged regulations, the court of appeals had the power and authority to

review the regulations. Old Abe Co. v. New Mexico Mining Comm'n, 121 N.M. 83, 908 P.2d 776 (Ct. App. 1995).

The court of appeals was without authority to review the constitutionality of the New Mexico Mining Act (69-36-1 to 69-36-20 NMSA 1978) in the case of an appeal challenging regulations on their face. Old Abe Co. v. New Mexico Mining Comm'n, 121 N.M. 83, 908 P.2d 776 (Ct. App. 1995).

Discretion of commission. — New Mexico mining commission acted within its discretion in ruling that the El Cajete mine was a new mining unit of the Las Conchas mine, rather than a new mining operation; the mines were owned by the same mining company and were substantially interrelated. Rio Grande Chapter of Sierra Club v. N.M. Mining Comm'n, 2003-NMSC-005, 133 N.M. 97, 61 P.3d 806.

69-36-17. Civil penalties.

A. Civil penalties may be assessed by the director or the commission for violations of the New Mexico Mining Act [69-36-1 to 69-36-20 NMSA 1978], including a violation of a regulation of the commission, an order of the director, a permit condition and the order resulting from a hearing.

B. Civil penalties assessed by the director or the commission shall be imposed pursuant to regulations adopted by the commission. Any penalty assessed shall not exceed ten thousand dollars ($10,000) per day of noncompliance for each violation.

C. Circumstances to be considered by the commission or the director in determining the amount of the penalty to be assessed shall be the seriousness of the violation, efforts to comply with the requirements of the New Mexico Mining Act, recent history of violations and other relevant factors as determined by the commission and regulations adopted by the commission.

D. Any penalty imposed by the director may be appealed to the commission, and any order of the commission concerning a penalty may be appealed de novo to the district court within thirty days from issuance of the order imposing the penalty.

History: Laws 1993, ch. 315, § 17.

69-36-18. Criminal penalties.

A. Any person who knowingly or willfully violates the New Mexico Mining Act, regulations adopted by the commission or a condition of a permit issued pursuant to the New Mexico Mining Act [69-36-1 to 69-36-20 NMSA 1978] or fails or refuses to comply with a final decision or order of the commission or the director is guilty of a misdemeanor and is subject to a fine not to exceed ten thousand dollars ($10,000) per day of violation or imprisonment of up to one year, or both.

B. Cases seeking criminal penalties shall be brought in the district court in Santa Fe.

C. Circumstances to be considered by the district court in determining the sentence shall be the seriousness of the violation, the efforts taken to comply with the requirements of the New Mexico Mining Act and the recent history of violations of the defendant.

History: Laws 1993, ch. 315, § 18.

69-36-19. Funds created.

A. There is created within the state treasury the "mining act fund". All money received by the state from permit applicants, permit holders, the federal government, other state agencies or legislative appropriations shall be delivered to the state treasurer and deposited in the fund. Disbursements from the fund shall be made upon warrants drawn by the secretary of finance and administration pursuant to vouchers signed by the secretary of energy, minerals and natural resources. Money in the fund is appropriated to the energy, minerals and natural resources department to carry out the purposes of the New Mexico Mining Act [69-36-1 to 69-36-20 NMSA 1978]. Any unexpended or unencumbered balance remaining in the mining act fund at the end of a fiscal year shall not revert to the general fund but shall remain and accrue to the benefit of the mining act fund.

B. There is created within the state treasury the "inactive or abandoned non-coal mine reclamation fund". All money received from administrative or court-imposed penalties shall be delivered to the state treasurer and deposited in the fund. Disbursements from the fund shall be made upon warrants drawn by the secretary of finance and administration pursuant to vouchers signed by the secretary of energy, minerals and natural resources. Money in the fund is appropriated to the energy, minerals and natural resources department to conduct reclamation activities on abandoned or inactive non-coal mining areas. Any unexpended or unencumbered balance remaining in the inactive or abandoned non-coal mine reclamation fund at the end of a fiscal year shall not revert to the general fund but shall remain and accrue to the benefit of the inactive or abandoned non-coal mine reclamation fund.

History: Laws 1993, ch. 315, § 19.

ANNOTATION

Transfer of funds. — Nothing in the Mining Act, the Wildlife Conservation Act (17-2-37 to 17-2-46 NMSA 1978), or other state laws prohibit the transfer of funds derived from fees imposed by the commission to the Department of Fish and Game to assist in implementing the Mining Act. New Mexico Mining Ass'n v. New Mexico Mining Comm'n, 1996-NMCA-098, 122 N.M. 332, 924 P.2d 741.

69-36-20. Remedy.

Nothing in the New Mexico Mining Act [69-36-1 to 69-36-20 NMSA 1978] shall limit any right that any person or class of persons may have pursuant to any statute or common law to seek enforcement of the New Mexico Mining Act and the regulations adopted pursuant to that act, or to seek any other relief.

History: Laws 1993, ch. 315, § 20.

CHAPTER 70
Oil and Gas

Property Overview

CB Richard Ellis | New Mexico Land Services Group has been engaged as the exclusive listing representative for the sale of La Bajada. The property consists of approximately 5,421+/- acres of vacant land of which includes 5,200 +/- acres of rich aggregate deposits for possible mining. (See Buildolgy correspondence).

La Bajada is the largest privately owned parcel of land located on Interstate 25 between Albuquerque and Santa Fe in New Mexico. It features over 10,000 feet of Interstate 25 frontage with two major north and south interchanges into the site. Exit 264 (State Highway 16) located at the northwest corner of the property connects to the Cochiti Indian Reservation and Santo Domingo Pueblo. Exit 267 (County Road 57) is at the northeast corner of the La Bajada property and connects Highway 14 to the Madrid/Cerrillos Mountains. La Bajada is approximately 35 minutes from the Albuquerque International Sunport and 15 minutes from Santa Fe Plaza.

This exceptional property has tremendous development potential, both in terms of a residential master plan and as an aggregate resource. La Bajada is uniquely situated between Albuquerque, New Mexico's largest metro area with a population of over 850,000, and the exclusive Santa Fe market. With an elevation of over 6,100 feet, La Bajada's terrain is rich and has varied scenic views from within the heart of the property, including views of Santa Fe National Forest, Cerrillos Mountains, Jemez Mountains, Sangre de Cristo Mountains, Sandia Mountains and the Ortiz Mountains.

The general area is recognized for its mining and railroad history. Existing mines within the area include Rosario and older mining towns of Waldo, Cerrillos and Madrid all adding to the ambiance of the area. Even today, the main rail line to northern New Mexico and Colorado runs through the heart of the land with plans to have the new Rail Runner spur come directly off the main line within the site. The light rail commuter train is due to be in service in late 2008.

INVESTMENT SUMMARY

Price: $65,052,000 ($12,000/acre)
Site Area: Approx. 5,421+/- Acres.
Property Description: The improvements consist of existing cell towers which are not part of offering, existing main line rail, and 5,200 +/- Acres of Aggregate
Legal Description: Tract A, B, & C La Bajada