STB FD-33388 04/29/04 K 210714

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April 30, 2004

By Hand Delivery – Original and 25 Copies
The Honorable Vernon A. Williams
Secretary
Surface Transportation Board
Room 700
1925 K Street, N.W.
Washington, D.C. 20423

Re: Finance Docket No. 33388: *CSX Corporation and CSX Transportation, Inc., Norfolk Southern Corporation and Norfolk Southern Railway Company - Control and Operating Leases/Agreements - Conrail Inc. and Consolidated Rail Corporation*: Decision No. 89, Appendix Q

Completion by Norfolk Southern Corporation and Norfolk Southern Railway Company of Compliance with Environmental Condition 11

Dear Secretary Williams:

As a update to the March 22, 2004 certification of compliance by Norfolk Southern Corporation and Norfolk Southern Railway Company ("Norfolk Southern" or "NS") with Environmental Condition 11 of Appendix Q of Decision No. 89 ("Environmental Condition 11") in the above-referenced proceeding, Norfolk Southern is pleased to advise the Board that is has resolved through settlement the noise mitigation claim of the sole receptor location along rail line segment N-100 that had not been settled as of the date of the March 22, 2004 certification. Subsequent to the March 22, 2004 submittal, NS was successful in contacting the owner of the property in Crimora, Virginia referenced in the March 22, 2004 certification. NS entered into an individual settlement agreement with the owner to resolve all noise mitigation claims under Environmental Condition 11. Accordingly, the settlement fund described in the March 22, 2004 certification established by NS to address potential noise mitigation at this receptor location is no longer needed and will be closed by NS.

NS has thus has completed all mitigation required by the Board under Environmental Condition 11.

Respectfully submitted,

Constance A. Sadler

cc: Victoria J. Rutson, SEA
Bruno Maestri, Norfolk Southern Corporation

STB FD-33388 03/22/04 K 210363

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March 22, 2004

By Hand Delivery – Original and 25 Copies
The Honorable Vernon A. Williams
Secretary
Surface Transportation Board
Room 700
1925 K Street, N.W.
Washington, D.C. 20423

Re: Finance Docket No. 33388: *CSX Corporation and CSX Transportation, Inc., Norfolk Southern Corporation and Norfolk Southern Railway Company – Control and Operating Leases/Agreements - Conrail Inc. and Consolidated Rail Corporation;* Decision No. 89, Appendix Q –

Certification by Norfolk Southern Corporation and Norfolk Southern Railway Company of Completion of Compliance with Environmental Condition 11

Dear Secretary Williams:

Norfolk Southern Corporation and Norfolk Southern Railway Company ("Norfolk Southern" or NS") hereby certify that Norfolk Southern has completed its mitigation obligations under Environmental Condition 11 of Appendix Q of Decision No. 89 ("Environmental Condition 11") in the above-referenced proceeding.

Pursuant to Environmental Condition 11, Applicants are required, with the written concurrence of the responsible local governments, to mitigate train wayside noise at the locations identified by the Surface Transportation Board in the Environmental Condition 11 table entitled "Receptors that Meet Wayside Noise Mitigation Criteria." Environmental Condition 11 further

provides that the specific requirements of the condition "shall not apply to those communities that have executed Negotiated Agreements with Applicants that satisfy the communities' environmental concerns."

Norfolk Southern previously informed the Surface Transportation Board ("STB" or "Board") that it had successfully completed its mitigation obligations under Environmental Condition 11 through negotiated agreements with local communities or, if requested by a local government, with individual property owners in that community, for rail line segments N-040 (Alexandria, IN to Muncie, IN), N-079 (Oak Harbor, OH to Bellevue, OH), N-080 (Bellevue, OH to Sandusky Dock, OH), N-111 (Fola Mine, WV to Deepwater, WV) and a portion of N-100 (Riverton Junction, VA to Roanoke, VA). The Board granted NS's request for an extension of time until March 22, 2004 to address the remaining portion of rail line segment N-100 in order to complete NS's Environmental Condition 11 obligations. Decision No. 211, STB Finance Docket No. 33388, served September 22, 2003.

With the assistance of local governmental representatives, NS completed a field verification survey along those portions of N-100 that were not subject to Negotiated Agreements or other settlement agreements. NS thereafter contacted the local governments of those jurisdictions to provide an opportunity to review the results of the field verification survey. NS contacted the owners of the noise-sensitive receptor locations along N-100 that were not already the subject of Negotiated Agreements or previous individual settlements. Through that effort, NS obtained settlements with the owners of the eligible noise-sensitive receptor locations along the remaining portion of rail line segment N-100.

In the case of a property located at N38°10.187, -W78°50.995 along N-100 near NS mile marker H135.8 in Crimora, Virginia, Norfolk Southern has attempted to contact the owner in person and by mail to obtain the information necessary to determine whether the property satisfies the eligibility criteria for noise mitigation under Environmental Condition 11. It appears to Norfolk Southern that the property likely does not qualify for noise mitigation under Environmental Condition 11. Nevertheless, Norfolk Southern on March 9, 2004 sent via registered mail a letter seeking such information from the owner or the owner's legal representative. To resolve this potential mitigation obligation under Environmental Condition 11, Norfolk Southern has established and will maintain for a period of one year, or until March 31, 2005, a fund containing the settlement monies that would be available to the owner of that property should the owner respond within that timeframe and provide information confirming that the property satisfies the eligibility criteria for noise mitigation under Environmental Condition 11. If the information necessary to confirm eligibility for noise mitigation under Environmental Condition 11 is not provided by the owner or the owner's legal representative by March 31, 2005, Norfolk Southern shall not be further obligated to maintain a settlement fund or

otherwise offer noise mitigation in connection with the property.

Respectfully submitted,

Constance A. Sadler

cc: Victoria J. Rutson, SEA
Bruno Maestri, Norfolk Southern Corporation

20775

NORFOLK SOUTHERN

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Bruno Maestri
Vice President
Public Affairs

May 9, 2003

By Hand Delivery – Original and 25 Copies
The Honorable Vernon A. Williams
Secretary
Surface Transportation Board
1925 K Street, NW
Room 700
Washington, D.C. 20423

Re: Finance Docket No. 33388, *CSX Corporation and CSX Transportation Inc., Norfolk Southern Corporation and Norfolk Southern Railway Company - Control and Operating Leases/Agreements - Conrail Inc. and Consolidated Rail Corporation*

Certification of Compliance with Environmental Condition 8(A) for York Rd., Mechanicsburg, PA and Guilford Springs Rd., Guilford Springs, PA At-grade Crossings; Completion of Environmental Condition 8(A) by Norfolk Southern Corporation and Norfolk Southern Railway Company

Dear Secretary Williams:

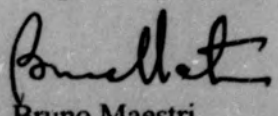
Enclosed please find twenty-five (25) hard copies and one electronic copy of the Norfolk Southern "Certification of Compliance with Environmental Condition 8(A), Appendix Q to Decision No. 89 for York Road/SR 74, Mechanicsburg, PA and Guilford Springs Road, Guilford Springs, PA At-grade Crossings" in the above-referenced docket.

Pursuant to Decision No. 209 in this docket, served August 22, 2002, the Surface Transportation Board extended until April 30, 2003 the date for completion by Norfolk Southern of the installation of improvements to the York Road/SR 74 at-grade crossing in Mechanicsburg, Pennsylvania (592290T). In satisfaction of the requirements of Environmental Condition 8(A) for this at-grade crossing and Decision No. 209, Norfolk Southern completed the improvements to the York Road/SR 74 at-grade crossing required by the Commonwealth of Pennsylvania in a May 21, 2002 letter issued by the Pennsylvania Public Utility Commission and the improved grade crossing was placed in service on March 19, 2003.

In addition, pursuant to Decision No. 155 in this docket, served May 31, 2000, the Board extended the period for installation by Norfolk Southern of improvements to the at-grade crossing at Guilford Springs Road in Guilford Springs Township, Pennsylvania (535146X) until six months following completion by Guilford Springs Township of the construction of the relocated road and at-grade crossing. In accordance with Decision No. 155, Norfolk Southern completed the improvements to the Guilford Springs Road at-grade crossing within that period and the improved grade crossing was placed in service on December 4, 2002.

With the completion of the required upgrades for those two at-grade crossings, Norfolk Southern has satisfied all of the mitigation requirements established by the Surface Transportation Board under Environmental Condition 8(A) applicable to Norfolk Southern.

Respectfully submitted,



Bruno Maestri

Enclosure

cc: Victoria J. Rutson, Esq. (5 copies)
Phillis Johnson-Ball

SURFACE TRANSPORTATION BOARD
STB FINANCE DOCKET NO. 33388

CSX CORPORATION AND CSX TRANSPORTATION, INC.
NORFOLK SOUTHERN CORPORATION AND
NORFOLK SOUTHERN RAILWAY COMPANY
-- CONTROL AND OPERATING LEASE AGREEMENTS –
CONRAIL INC. AND CONSOLIDATED RAIL CORPORATION

Decision 89, as Amended by Decision 96
Appendix Q, Environmental Conditions
III. Local or Site-Specific Environmental Conditions
Condition 8(A): Highway/Rail At-Grade Crossings

Completion of Environmental Condition 8(A)
Norfolk Southern Corporation and
Norfolk Southern Railway Company

May 9, 2003

CERTIFICATION OF COMPLIANCE

In accordance with Environmental Condition 8(A), Appendix Q to Decision No. 89 of the Surface Transportation Board in Docket No. 33388, Norfolk Southern Corporation and Norfolk Southern Railway Company ("Norfolk Southern") hereby certify that Norfolk Southern has completed the improvements required to be installed for the following at-grade crossings:

York Rd./SR 74, Mechanicsburg, Pennsylvania

Guilford Springs Rd, Guilford Springs, Pennsylvania

Furthermore, Norfolk Southern hereby certifies that it has completed all actions required by the Board to be implemented by Norfolk Southern pursuant to Environmental Condition 8(A) and the Board's orders modifying that condition.

Certified by:

Bruno Maestri
Vice President Public Affairs
Norfolk Southern Corporation

Date: May 9, 2003

STB	FD-33388	4/30/03	K	STBSEA

SURFACE TRANSPORTATION BOARD

Washington, DC 20423

Office of Economics, Environmental Analysis, and Administration

April 30, 2003

Ms. Rosemary Bradley, Executive Director
Twin Rivers Council of Governments
3000 Lebanon Church Road
West Mifflin, Pennsylvania 15122

Re: Finance Docket No. 33388, CSX Corporation and CSX Transportation, Inc., Norfolk Southern Corporation and Norfolk Southern Railway Company – Control and Operating Leases/Agreements – Conrail Inc. and Consolidated Rail Corporation; Question Concerning Eligibility of South Versailles Township for Noise Mitigation

Dear Ms. Bradley:

I am writing to respond to your letter on behalf of the Twin Rivers Council of Governments dated April 7, 2003 to Mr. Melvin Clemens, Director of the Surface Transportation Board's (Board) Office of Compliance and Enforcement. I understand that Mr. Clemens informed you by letter dated April 15 that he was forwarding your letter to me for response.

In your letter you ask why South Versailles Township was determined to be ineligible for Board-ordered noise mitigation (in the form of funds released by CSX Transportation, Inc.) as part of the Conrail merger. To answer your question, I have summarized the analysis and conclusions pertinent to the issue of merger-related noise in South Versailles Township from the Environmental Impact Statement prepared by the Board's Section of Environmental Analysis (SEA) for the Conrail merger.

To trigger the Board's noise threshold for analysis (set forth at 49 CFR 1105.7(e)), a rail line segment must experience an increase in rail activity of at least 100 percent (measured in gross ton miles annually) or an increase of eight or more trains per day. If the increased traffic on the rail line segment triggers the Board's threshold, in order to be eligible for mitigation, the line segment must be found to experience a 5 dBA Ldn increase in noise levels and a total exposure to noise levels of least 70 dBA Ldn as a result of merger-related rail traffic.

In the Environmental Impact Statement prepared for this proceeding, SEA determined that the South Versailles Township rail line segment (located between Cumberland, Maryland and Sinns, Pennsylvania and known as the "Cumberland to Sinns" line segment) was, as a result

of the Conrail merger, projected to experience an increase of 5.1 freight trains per day and a 33 percent increase in gross ton miles annually. This projected increase in traffic did not trigger the Board's threshold for detailed noise analysis, therefore, SEA did not conduct a detailed analysis on this line segment, consistent with the Board's environmental rules.

I have attached two tables from the Environmental Impact Statement for the Conrail merger that may be useful to you: Table 1 provides a description and rationale of the Board's thresholds and criteria used to evaluate potential environmental effects that may occur as a result of a railroad merger and Table 2 provides pre-merger and post-merger traffic data for the Cumberland to Sinns line segment.

I hope that I have clarified the Board's approach to noise analysis in the Conrail merger and that this information is helpful to you. If you have any additional questions, please feel free to call Ms. Phillis Johnson-Ball of my staff at 202- 565-1530.

Sincerely,

Victoria Rutson
Chief
Section of Environmental Analysis

TABLE 1
RATIONALE FOR BOARD'S THRESHOLDS AND CRITERIA

Environmental Impact Category	Activities Evaluated for Potential Environmental Effects			
	Threshold for Environmental Analysis	**Rationale for Threshold**	**Criteria of Significance**	**Rationale for Criteria**
Safety-				
Freight Rail Operations Safety	1. SEGMENT: Rail line segments with an average increase of eight or more freight trains per day.	Focuses analysis on areas where impacts are likely to occur. Experience in other acquisitions has shown increases of less than 8 are not likely to exceed criteria of significance.	Increase in accident rate for each segment would be greater than the normal variance in the state-wide accident rate, and post-Acquisition accident rate greater than 1 accident every 100 years.	1. Acquisition-related increase in accidents would be greater than normal fluctuations in accident rates. 2. Criterion is a conservative comparison with the national (1996) accident rate of 1 accident every 117 years
	2. SYSTEM-WIDE: All segments included.	Nature of system-wide analysis.	Comparison with historical accident rates and annual fluctuations.	Qualitative comparison of change in accident rate with historical trends (generally declining accident rate).
Hazardous Materials Transport Safety	1. SEGMENTS: Rail line segments with an increase in the annual volume of hazardous materials transported.	SEGMENTS: Risk increases with amount of material carried.	SEGMENTS: Two levels of criteria: 1. Increase of more than 10,000 hazardous materials railcars per year (would warrant Key Route Mitigation). 2. Doubling of hazardous materials traffic to more than 20,000 railcars per year (would warrant Major Key Route mitigation). For all main line traffic changes with increased risk, SEA reviewed magnitude of change in risk, and the railroad plans for addressing hazardous materials accidents.	1. Existing Federal regulations govern the safe transport of hazardous materials. 2. Key Route mitigation is an industry-accepted standard for providing additional safety measures. 3. Doubling of hazardous materials railcars viewed as a substantial change warranting coordination with local emergency response agencies. SEA considers doubling to less than 20,000 carloads (i.e., an increase of less than 10,000 carloads) to be within normal fluctuation of hazardous materials transport. For this, and previous Acquisitions, SEA determined that a qualitative review of risk is appropriate, given the very large post-Acquisition release intervals.

TABLE -1
RATIONALE FOR BOARD'S THRESHOLDS AND CRITERIA

Environmental Impact Category	Activities Evaluated for Potential Environmental Effects			
	Threshold for Environmental Analysis	Rationale for Threshold	Criteria of Significance	Rationale for Criteria
Hazardous Materials Transport Safety (continued)	2. FACILITIES: All intermodal facilities and rail yards with an increase in railcar activity.	FACILITIES: Examining all intermodal and rail yard facilities with increased activity is a very conservative approach that captures all activities with any potential for adverse effect.	Qualitative	Evaluation qualitative because risk of release because risk rates were extremely low (i.e., no risk of release greater than once every 24 years in the CN/IC Acquisition).
Passenger Rail Operations Safety	Rail line segments with existing passenger rail traffic and an average increase of one or more freight trains per day.	Very conservative threshold to capture all increases in train traffic where passenger trains operate.	A 25% increase in the projected accident rate and interval of less than 150 years between accidents.	National accident rate varies by 30% annually; 25% is a conservative measure for identifying all acquisition-related changes outside normal variation. Second criteria based on average annual accident rate for various passenger service providers.
Highway/Rail At-grade Crossing Safety	All highway/rail at-grade crossings on rail line segments with an average increase of eight or more trains per day. Highway/rail at-grade crossings created by proposed constructions on rail line segments with an average increase of eight or more trains per day.	Focuses analysis on areas where impacts are likely to occur. Experience in other acquisitions has shown increases of less than eight not likely to exceed criteria of significance.	Increase of 0.05 accidents per year (1 in 20 years) considered significant, except at "high-risk" intersections (in the state "top 50" or with more than 1 accident in seven years) where a smaller increase of 0.01 accident per year (1 in 100 years) is considered significant.	Criteria based on reasonable estimate of acceptable accident risk at grade crossings. The dual criteria addresses concern that small increase in risky area is more significant than a larger increase in a less risky area.

TABLE -1
RATIONALE FOR BOARD'S THRESHOLDS AND CRITERIA

Environmental Impact Category	Activities Evaluated for Potential Environmental Effects			
	Threshold for Environmental Analysis	Rationale for Threshold	Criteria of Significance	Rationale for Criteria
Traffic and Transportation				
Highway/Rail At-grade Crossing Delay	1. Highway/rail at-grade crossings on segments that meet or exceed the Board's thresholds for environmental analysis,[b] and with average daily traffic (ADT) of 5,000 vehicles or greater, or crossings within 800 feet. 2. Highway/rail at-grade crossings created by proposed construction on rail line segments that meet or exceed the Board's thresholds for environmental analysis and with ADT of 5,000 or more, or crossings closer than 800 feet.	Focuses analysis on areas where impacts are likely to occur. Experience in other acquisitions has shown increases less than eight not likely to exceed criteria of significance.	1. Increase by 30 seconds, or 2. Drop to Level-of-Service (LOS) D from A, B or C or post-Acquisition LOS E or F.	1. Basis for 30 second delay based on studies of driver perception of delay and tolerance levels. 2. LOS also based on Transportation Research Board's Highway Capacity Manual evaluation of delay and driver acceptability.
Passenger Rail Service Capacity	Rail line segments with existing passenger rail traffic and an increase of one or more freight trains per day.	Conservative measure for identifying all relevant segments with increased freight traffic.	Any reduction in passenger rail service of one passenger train or more.	Any reduction in passenger service is significant.
Roadway Capacity	Intermodal facilities with an increase of 50 or more trucks per day or a 10% increase in ADT on affected roadways.	Board Rules specify this threshold Focuses analysis on areas where impacts are likely to occur. Experience in other acquisitions has shown lower increases not likely to result in significant effects.	Evaluated on a case-by-case basis.	Allows SEA to consider and respond to local situations.
Navigation	Movable-span bridges on any rail line segments.	Conservative measure for identifying all potential navigation issues.	None, because navigation is regulated by Coast Guard and has priority over train traffic at moveable span bridges.	SEA does not have authority to override U.S. Coast Guard jurisdiction.

TABLE 1
RATIONALE FOR BOARD'S THRESHOLDS AND CRITERIA

Environmental Impact Category	Activities Evaluated for Potential Environmental Effects			
	Threshold for Environmental Analysis	**Rationale for Threshold**	**Criteria of Significance**	**Rationale for Criteria**
Energy	System-wide evaluation of truck-to-rail diversions. System-wide evaluation of changes in activity at intermodal facilities. System-wide evaluation of changes in activity at rail yards.	Board Rules specify threshold.	SEA has not developed criteria because Acquisitions have always resulted in energy efficiencies.	Not Applicable
Air Quality				
Air Quality	SYSTEM-WIDE: All changes in rail activity.	Nature of system-wide analysis.	SYSTEM-WIDE: None, because overall, air emissions have decreased as a result of previous acquisitions. Where there have been increases, qualitative comparison with total emissions for the study area.	Not Applicable
Air Quality: Attainment or Maintenance Areas	COUNTY-WIDE: 1. Rail line segments with an increase of eight or more trains per day or at least a 100% increase in rail traffic (measured in annual gross ton-miles). 2. Intermodal facilities with an increase of 50 or more trucks per day or more than a 10% increase in ADT on affected roadways. 3. Rail yards with a 100% or greater increase in carload activity. 4. All constructions.	Board Rules specify threshold.	COUNTY-WIDE: Significant if total emissions from rail activities exceed 1.6% of EPA's total emissions inventory for the county, and exceed EPA's screening criteria for stationary sources for the individual criteria pollutant. For PM_{10}, contributions are considered significant if PM_{10} emissions from rail activities exceed 1% of EPA's total emissions inventory for the county and exceed EPA's PM_{10} screening criteria for stationary sources.	In the absence of specific criteria for rail activities, SEA selected stationary source standards because they are more conservative than mobile sources (i.e.,automobiles).

TABLE -1
RATIONALE FOR BOARD'S THRESHOLDS AND CRITERIA

Environmental Impact Category	Activities Evaluated for Potential Environmental Effects			
	Threshold for Environmental Analysis	**Rationale for Threshold**	**Criteria of Significance**	**Rationale for Criteria**
Air Quality: Nonattainment Areas	COUNTY-WIDE: 1. Segments with an increase of three or more trains per day or at least a 50% increase in rail traffic (annual gross ton-miles).[b] 2. Intermodal facilities with an increase of 50 or more trucks per day or more than a 10% increase in ADT on affected roadways. 3. Rail yards with a 20% or greater increase in carload activity. 4. All constructions.	Board Rules specify threshold.	COUNTY-WIDE: For nonattainment areas, contributions are considered significant if total emissions from rail activities exceed 1% of EPA's total emissions inventory for the county and exceed EPA's screening criteria for stationary sources for the individual pollutant.	In the absence of specific criteria for rail activities, SEA selected stationary source standards because they are more conservative than mobile sources (i.e.,automobiles)
Noise	1. Rail line segments with an increase of eight or more trains per day or a 100% increase in annual gross ton-miles. 2. Intermodal facilities with an increase of 50 or more trucks per day or more than a 10% increase in ADT on affected roadways. 3. Rail yards with a 100% or greater increase in carload activity. 4. All constructions.	Board Rules specify threshold.	SEA considers increases to noise levels above 65 dBA, with an increase of 3 dBA or more, significant. SEA's mitigation recommendations are based on consideration of safety and the overall cost of mitigation for each Acquisition.	Most Federal agencies (DOT, HUD, etc.) use 65 dBA as their threshold of significance. The criterion includes the increase in noise because the Board considers mitigation only for Acquisition-related environmental impacts.

TABLE -1
RATIONALE FOR BOARD'S THRESHOLDS AND CRITERIA

Environmental Impact Category	Activities Evaluated for Potential Environmental Effects			
	Threshold for Environmental Analysis	Rationale for Threshold	Criteria of Significance	Rationale for Criteria
Land Use	All constructions.	Construction activities are likely to require demolition, excavation or physical change to the structure and other characteristics that make up a community.	• Consistency with Land Use Plans • Use of Prime Farmland. • Consistency with Coastal Zone Management • Encroachment into Native American Reservations and Lands.	SEA based the criteria for determining adverse effects in accordance with the Board's rule in 49 CFR 1105.7(e)(3) and NEPA regulations under 40 CFR 1502.16(c).
Cultural Resources	All constructions.	Construction activities are likely to require demolition, excavation or physical change to structures.	Based on ACHP "Criteria of Effect and Adverse Effect," an action has an effect on a historic property when it "may alter characteristics of the property that may qualify the property for inclusion in the National Register." This effect is considered to be adverse if it "may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association."	Based on regulations at 36 CFR 800.9

TABLE A-1
RATIONALE FOR BOARD'S THRESHOLDS AND CRITERIA

Environmental Impact Category	Activities Evaluated for Potential Environmental Effects			
	Threshold for Environmental Analysis	**Rationale for Threshold**	**Criteria of Significance**	**Rationale for Criteria**
Natural Resources	All constructions.	Construction activities are likely to require demolition, excavation or physical change to structures.	**Biological resources:** • Adverse effect on critical habitats for Federally listed threatened or endangered species. • Loss or degradation of wildlife sanctuaries, refuges, national parks, or national forests that significantly alters the function or accessibility of those resources. • Disruption of wildlife movements or migratory corridors that significantly alters regional population numbers or diversity.	Criteria are based on review of regulations to protect natural resources, and past experience with other environmental evaluations.
Natural Resources (Continued)			**Water Resources:** • The removal, alteration, or filling of wetlands or other waterbodies. • Effects on wetlands in known habitats for threatened or endangered species. • Effects on identified drinking water sources. • Effects on floodplains that significantly alter the flooding patterns within (and adjacent to) the site of the proposed construction.	

TABLE 1
RATIONALE FOR BOARD'S THRESHOLDS AND CRITERIA

Environmental Impact Category	Activities Evaluated for Potential Environmental Effects			
	Threshold for Environmental Analysis	Rationale for Threshold	Criteria of Significance	Rationale for Criteria
Hazardous Waste Sites	All constructions.	Construction activities are likely to require demolition, excavation or physical change to sites which may contain hazardous wastes.	• The construction activities would pose a threat to human health or the environment by disturbing sites containing hazardous materials. • The construction activities would disturb sites where contaminants were contained in place to reduce the possibility of threats to human health or the environment (e.g., covered contaminants with a clay, soil, or asphalt cap).	Criteria focuses on threats to human health and safety, and is responsive to other regulatory programs.

TABLE 1
RATIONALE FOR BOARD'S THRESHOLDS AND CRITERIA

Environmental Impact Category	Activities Evaluated for Potential Environmental Effects			
	Threshold for Environmental Analysis	Rationale for Threshold	Criteria of Significance	Rationale for Criteria
Environmental Justice	All activities exceeding Board thresholds for environmental analysis.	Very conservative measure as it looks at all effects of transaction without mitigation measures. Analysis method also allows early notification in communities with EJ populations. SEA completed system-wide, state, and regional statistical tests to determine if high and adverse effects could have disproportionate impacts on environment justice populations. System-wide—SEA used the statistical tests to compare impacts to all affected populations. State—SEA compared impacts for any state that had a Census Block group with an ERS of 5 or greater or had more than one ERS of 3.5 or great.r (and thus an MRS of at least 24.5, or 3.5 squared time two). Regional—SEA identified regions in any state for which it completed the state statistical analysis. SEA compared impacts for any region that had a Census block group with an ERS of 5 or greater or had more than one ERS of 3.5 or greater (and thus an MRS of at least 24.5, or 3.5 squared times two).	SEA determined that impacts would be disproportionate if the statistical tests showed that the Census block groups with environmental justice populations would experience high and adverse effects in greater proportions than those Census block groups with non-environmental justice populations.	Uses quantifiable criteria to identify areas of disproportionality. Because criteria is applied before mitigation is considered, it allows SEA to determine how effective general mitigation will be in EJ communities, allows SEA to tailor mitigation spec fic to those communities and circumstance for maximum effectiveness.

ATTACHMENT ES-B
MASTER TABLE OF ALL RAIL LINE SEGMENTS

SEG ID	OWNERSHIP PRE ACQ	OWNERSHIP POST ACQ	SEGMENT COUNT 1022 — SEGMENT DESCRIPTION BETWEEN		AND		SEG LENGTH (mi.) 35,733	PASSENGER & FREIGHT TRAIN DATA — 1995 BASE PSGR TRN	1995 BASE FRT TRN	1995 BASE TOTAL	POST ACQUISITION PSGR TRN	POST ACQUISITION FRT TRN	POST ACQUISITION TOTAL	Δ	MILLION GROSS TONS (1) 1995 BASE	MILLION GROSS TONS (1) POST ACQ	Δ	THRESHOLD MET 110 AIR	111 NOISE	112 PSGR TRN	113 FRT TRN	332 HAZMAT
C-001	CR	CSX	Anacostia	DC	Virginia Ave	DC	3	0.0	19.3	19.3	0.0	28.6	28.6	9.3	40.3	45.2	12%	X	X		X	X
C-002	CR	CSX	Virginia Ave	DC	Potomac Yard	VA	6	44.5	17.9	62.4	44.5	28.6	73.1	10.7	40.3	47.7	18%	X	X	X	X	X
C-003	CSX	CSX	Washington	DC	Pt of Rocks	MD	43	20.0	23.8	43.8	20.0	30.8	50.8	7.0	37.8	56.0	48%	X		X		X
C-010	CSX	CSX	Barr Yd	IL	Blue Island Jct	IL	3	0.0	17.0	17.0	0.0	32.9	32.9	15.9	25.0	58.0	132%	X	X		X	
C-011	CSX	CSX	Blue Island Jct	IL	59th Street	IL	15	0.0	19.5	19.5	0.0	22.9	22.9	3.4	27.0	27.0	37%	X				X
C-020	CR	CSX	Adams	IN	Ft Wayne	IN	5	0.0	5.9	5.9	0.0	13.9	13.9	8.0	3.4	18.8	460%	X	X		X	
C-021	CSX	CSX	Evansville	IN	Amqui	TN	137	0.0	23.4	23.4	0.0	32.7	32.7	9.3	48.3	73.8	53%	X	X		X	X
C-022	CR	CSX	Ft Wayne	IN	Warsaw	IN	40	0.0	2.4	2.4	0.0	6.4	6.4	4.0	4.0	12.6	214%	X	X			
C-023	CSX	CSX	Pine Jct	IN	Barr Yd	IL	11	0.0	27.6	27.6	0.0	33.3	33.3	5.7	40.9	64.7	58%	X				X
C-024	CR	CSX	Tolleston	IN	Clark Jct	IN	4	0.0	0.0	0.0	0.0	5.0	5.0	5.0	0.0	12.2	1000%	X	X			
C-025	CSX	CSX	Vincennes	IN	Evansville	IN	53	0.0	22.3	22.3	0.0	30.8	30.8	8.5	44.7	78.4	75%	X	X		X	X
C-026	CR	CSX	Warsaw	IN	Tolleston	IN	83	0.0	1.0	1.0	0.0	5.0	5.0	4.0	4.0	12.2	206%	X	X			
C-027	CSX	CSX	Willow Creek	IN	Pine Jct	IN	12	2.0	20.1	22.1	2.0	36.6	38.6	16.5	34.2	70.1	105%	X	X	X	X	X
C-030	CSX	CSX	Alexandria Jct	MD	Benning	DC	6	0.0	18.7	18.7	0.0	24.3	24.3	5.6	40.3	51.3	27%	X				X
C-031	CSX	CSX	Alexandria Jct	MD	Washington	DC	5	22.0	23.9	45.9	22.0	30.8	52.8	6.9	34.5	56.1	63%	X		X		X
C-032	CSX	CSX	Baltimore	MD	Relay	MD	7	22.0	39.6	61.6	22.0	41.7	64.7	3.1	63.7	70.5	11%	X		X		X
C-033	CSX	CSX	Cumberland	MD	Sims	PA	133	2.0	27.4	29.4	2.0	32.5	34.5	5.1	40.7	53.9	33%	X		X		X
C-034	CSX	CSX	Jessup	MD	Alexandria Jct	MD	17	22.0	33.4	55.4	22.0	37.1	59.1	3.7	48.0	69.7	45%	X		X		X
C-035	CR	CSX	Landover	MD	Anacostia	DC	5	0.0	3.4	3.4	0.0	9.1	9.1	5.7	5.0	10.9	117%	X	X			X
C-036	CSX	CSX	Pt of Rocks	MD	Harpers Ferry	WV	13	25.0	33.3	58.3	25.0	41.8	66.8	8.3	58.0	75.6	30%	X	X	X	X	
C-037	CSX	CSX	Relay	MD	Jessup	MD	7	22.0	33.1	55.1	22.0	37.0	59.0	3.9	45.8	57.8	26%	X		X		X
C-040	CSX	CSX	Carleton	MI	Toledo	OH	26	0.0	21.9	21.9	0.0	33.1	33.1	11.2	40.0	64.2	61%	X	X		X	X
C-050	CR	CSX	Buffalo	NY	CP Sycamore	NY	1	0.0	13.5	13.5	0.0	19.5	18.5	5.0	19.0	24.0	50%	X				
C-051	CR	CSX	Chili	NY	Frontier	NY	51	7.1	40.6	47.7	7.1	45.9	53.0	5.3	79.7	92.1	16%	X		X		X
C-052	CR	CSX	CP Sycamore	NY	Black Rock	NY	6	0.0	21.5	21.5	0.0	26.5	26.5	5.0	32.0	42.0	31%	X				X
C-053	CR	CSX	Hoffmans	NY	Utica	NY	66	7.4	38.3	45.7	7.4	44.8	52.2	6.5	78.2	88.8	17%	X				X
C-054	CR	CSX	Selkirk	NY	Hoffmans	NY	25	0.0	38.7	38.7	0.0	45.2	45.2	6.5	78.5	88.4	13%	X				X
C-060	CR	CSX	Ashtabula	OH	Quaker	OH	47	2.0	48.3	50.3	2.0	54.2	56.2	5.9	102.8	107.8	5%	X		X		X
C-061	CR	CSX	Berea	OH	Greenwich	OH	42	0.0	14.5	14.5	0.0	54.2	54.2	39.7	30.9	108.4	250%	X	X		X	X
C-062	CR	CSX	Bucyrus	OH	Adams	IN	114	0.0	5.9	5.9	0.0	13.9	13.9	8.0	3.7	18.8	412%	X	X		X	
C-063	CSX	CSX	Cincinnati	OH	Hamilton	OH	21	1.0	28.2	29.2	1.0	31.2	32.2	3.0	55.3	64.1	16%	X		X		X
C-064	CR	CSX	Crestline	OH	Bucyrus	OH	12	0.0	8.5	8.5	0.0	14.5	14.5	8.0	3.7	19.0	417%	X	X		X	
C-065	CSX	CSX	Deshler	OH	Toledo	OH	36	0.0	0.6	0.6	0.0	14.2	14.2	13.6	2.3	49.6	15913%	X	X		X	X
C-066	CSX	CSX	Deshler	OH	Willow Creek	IN	174	2.0	21.4	23.4	2.0	47.7	49.7	26.3	44.6	94.1	111%	X	X	X	X	X
C-067	CR	CSX	Greenwich	OH	Crestline	OH	21	0.0	14.5	14.5	0.0	31.3	31.3	16.8	30.9	58.3	88%	X	X		X	X
C-068	CSX	CSX	Greenwich	OH	Willard	OH	12	2.0	32.5	34.5	2.0	55.2	57.2	22.7	55.8	109.4	96%	X	X	X	X	X
C-069	CR	CSX	Mercy	OH	Short	OH	9	0.0	19.4	19.4	0.0	45.8	45.8	29.4	26.0	95.4	267%	X	X		X	X
C-070	CSX	CSX	Marion	OH	Fostoria	OH	40	0.0	17.8	17.8	0.0	27.4	27.4	9.6	40.9	82.5	56%	X	X		X	X
C-071	CR	CSX	Marion	OH	Ridgeway	OH	23	0.0	16.1	16.1	0.0	31.8	31.8	15.7	39.0	51.2	31%	X	X		X	
C-072	CR	CSX	Mayfield	OH	Mercy	OH	6	0.0	3.4	3.4	0.0	43.8	43.8	40.4	9.0	93.0	933%	X	X		X	X
C-073	CR	CSX	Quincy	OH	Mayfield	OH	3	0.0	6.8	6.8	0.0	43.8	43.8	37.0	9.0	93.0	933%	X	X		X	X
C-074	CR	CSX	Short	OH	Berea	OH	4	0.0	13.4	13.4	0.0	47.3	47.3	33.9	15.0	101.6	578%	X	X		X	X
C-075	CSX	CSX	Willard	OH	Fostoria	OH	37	2.0	32.5	34.5	2.0	54.0	56.0	21.5	55.8	109.8	97%	X	X	X	X	X
C-080	CR	CSX	Field	PA	Belmont	PA	4	0.0	8.2	8.2	0.0	15.8	15.8	7.6	11.2	20.0	80%	X				X
C-081	CSX	CSX	New Castle	PA	Youngstown	OH	18	2.0	32.6	34.6	2.0	39.8	41.8	7.0	53.8	78.5	46%	X	X	X	X	X
C-082	CSX	CSX	Rankin Jct	PA	New Castle	PA	51	0.0	28.9	28.9	0.0	39.3	39.3	9.4	41.3	72.1	74%	X	X		X	X
C-083	CR	CSX	RG	PA	Field	PA	2	0.0	0.0	0.0	0.0	16.0	16.0	16.0	0.0	16.5	1000*	X	X		X	X
C-084	CSX	CSX	RG	PA	Wilsmere	DE	26	0.0	22.9	22.9	0.0	26.4	26.4	3.5	39.7	49.0	23%	X				X
C-085	CSX	CSX	Sims	PA	Brownsville	PA	38	0.0	1.5	1.5	0.0	10.8	10.8	9.3	2.0	23.3	1055%	X	X		X	
C-086	CSX	CSX	Sims	PA	Rankin Jct	PA	9	2.0	30.8	32.8	2.0	40.2	42.2	9.4	40.3	71.6	77%	X	X	X	X	X
C-090	CSX	CSX	Amqui	TN	Nashville	TN	16	0.0	40.8	40.8	0.0	48.4	48.4	7.6	80.1	104.1	30%	X				X
C-100	CSX	CSX	Doswell	VA	Fredericksburg	VA	37	18.0	16.2	34.2	18.0	22.8	40.8	6.6	40.7	52.0	28%	X		X		X
C-101	CSX	CSX	Fredericksburg	VA	Potomac Yard	VA	49	30.0	16.3	46.3	30.0	23.4	53.4	7.1	40.3	51.8	29%	X		X		X
C-102	CSX	CSX	Richmond	VA	Doswell	VA	24	18.0	17.8	35.8	18.0	24.8	42.8	7.0	44.0	53.8	22%	X		X		X
C-103	CSX	CSX	S. Richmond	VA	Weldon	NC	82	10.0	18.4	28.4	10.0	23.0	33.0	4.6	47.5	56.0	18%	X		X		X
C-110	CSX	CSX	WD Tower	WV	Rivesville	WV	4	0.0	1.5	1.5	0.0	3.4	3.4	1.9	3.6	7.4	108%	X	X			
C-200	CSX	CSX	Park Jct	PA	RG	PA	4	0.0	25.0	25.0	0.0	15.6	15.6	-9.4	44.7	23.8	-47%					
C-201	CSX	CSX	Wilsmere	DE	Baltimore	MD	88	0.0	26.9	26.9	0.0	28.8	28.8	1.9	44.0	50.4	14%					X
C-202	CSX	CSX	Harpers Ferry	WV	Cherry Run	WV	32	12.0	33.3	45.3	12.0	40.6	52.6	7.3	58.0	74.8	29%				X	X
C-203	CSX	CSX	Cherry Run	WV	Cumberland	MD	65	2.0	29.0	31.0	2.0	31.0	33.0	2.0	61.7	67.3	9%				X	
C-204	CSX	CSX	Youngstown	OH	Sterling	OH	79	2.0	32.6	34.6	2.0	33.9	35.9	1.3	53.8	66.5	24%				X	X
C-205	CSX	CSX	Sterling	OH	Greenwich	OH	37	2.0	32.5	34.5	2.0	32.9	34.9	0.4	54.8	62.1	13%					X
C-206	CSX	CSX	Fostoria	OH	Deshler	OH	26	2.0	34.0	36.0	2.0	37.9	39.9	3.9	61.0	70.0	15%				X	X
C-207	CSX	CSX	Relay	MD	Pt of Rocks	MD	58	0.0	9.3	9.3	0.0	9.2	9.2	-0.1	19.1	20.7	8%					
C-208	CSX	CSX	Hagerstown	MD	Lurgan	PA	34	0.0	2.3	2.3	0.0	2.5	2.5	0.2	3.6	2.4	-33%					
C-209	CSX	CSX	Hagerstown	MD	Cherry Run	MD	19	0.0	3.0	3.0	0.0	2.0	2.0	-1.0	6.0	2.4	-59%					
C-210	CSX	CSX	Rockwood	PA	Johnstown	PA	45	0.0	1.0	1.0	0.0	1.0	1.0	0.0	0.7	0.7	0%					
C-211	CSX	CSX	Lester	OH	Lorain	OH	23	0.0	1.4	1.4	0.0	1.4	1.4	0.0	0.7	0.7	0%					
C-212	CSX	CSX	Sterling	OH	Lester	OH	16	0.0	5.3	5.3	0.0	5.3	5.3	0.0	7.0	7.5	7%					
C-213	CSX	CSX	Lester	OH	Cleveland	OH	30	0.0	5.8	5.8	0.0	5.8	5.8	0.0	6.3	7.5	19%					
C-214	CSX	CSX	Detroit	MI	Plymouth	MI	25	0.0	15.1	15.1	0.0	12.3	12.3	-2.8	12.8	11.1	-13%					X
C-215	CSX	CSX	Plymouth	MI	Grand Rapids	MI	124	0.0	11.4	11.4	0.0	6.4	6.4	-5.0	13.4	9.8	-27%					
C-216	CSX	CSX	Grand Rapids	MI	Waverly	MI	26	2.0	8.2	10.2	2.0	4.5	6.5	-3.7	8.2	5.6	-32%					
C-217	CSX	CSX	Waverly	MI	Porter	IN	110	2.0	4.8	6.8	2.0	2.8	4.8	-2.0	8.7	3.3	-62%					
C-218	CSX	CSX	Saginaw	MI	Flint	MI	29	0.0	10.0	10.0	0.0	12.2	12.2	2.2	10.3	12.1	18%					X
C-219	CSX	CSX	Flint	MI	Holly	MI	28	0.0	12.8	12.8	0.0	14.0	14.0	1.2	14.5	17.8	22%					X
C-220	CSX	CSX	Holly	MI	Wixom	MI	20	0.0	11.3	11.3	0.0	12.5	12.5	1.2	14.5	17.4	20%					X
C-221	CSX	CSX	Wixom	MI	Plymouth	MI	12	0.0	12.2	12.2	0.0	12.9	12.9	0.7	16.3	18.5	14%					X
C-222	CSX	CSX	Plymouth	MI	Wayne	MI	8	0.0	23.6	23.6	0.0	26.5	26.5	2.9	51.0	53.1	4%					X
C-223	CSX	CSX	Wayne	MI	Carleton	MI	15	0.0	22.8	22.8	0.0	24.8	24.8	2.0	44.0	57.4	30%					X
C-224	CSX	CSX	Hamilton	OH	Dayton	OH	34	0.0	25.4	25.4	0.0	26.5	26.5	1.1	49.9	50.4	1%					X

Δ : Change due to Acquisition

(1) 1000% is reported for Δ where the "pre" quantity is zero and the "post" quantity greater than zero

STB	FD-33388	04/14/03	K	EI-45	STBSEA

FD 33388

EL-45

Twin Rivers Council of Governments

3000 Lebanon Church Road
West Mifflin, PA 15122
Phone: (412) 466-7377
Fax: (412) 466-7378

April 7, 2003

Mel Clemens, Director
Office of Compliance and Enforcement
Surface Transportation Board
1925 K. Street N.W.- Suite 780
Washington, D. C. 20423

Dear Director Clemens:

Twin Rivers Council of Governments is writing on behalf of the Township of South Versailles, located 18 miles southeast of Pittsburgh in Allegheny County, Pennsylvania.

It is not unusual for a community to request our assistance in matters of concern and we have been able to work in the past with South Versailles Township in areas of Health and Safety.

We are requesting your assistance to investigate the oversight of South Versailles Township not being included or considered for noise abatement; or explain why they were ineligible for the noise abatement funds released by the Railroad when the acquisition of Conrail/CSX took place.

South Versailles Township cannot recall receiving any communication regarding the abatement process and they feel that the traffic has increased to almost double causing the PUC to approve a bonifide crossing with signalization. Any funds that would be awarded to South Versailles Township for noise abatement would be used towards the payment of the engineering fees required by CSX as the Townships share of the crossing, which is in excess of $12,000.

South Versailles Township has 350 in population making up 150 households with the railroad running through the length of the community along the Youghiogheny River. Their entire Township budget is $64,000 for 2003 making any additional expenses outside the usual line items a hardship.

Your explanation will be greatly appreciated as we have no idea why or how South Versailles Township was left out of the agreement or ever contacted to discuss the matter.

Sincerely,

Rosemary Bradley
Executive Director

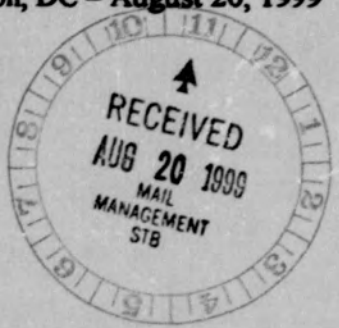
STB FD 33388 8-20-99 K FAILURE 1/4

NORFOLK SOUTHERN

Norfolk Southern Corporation
1500 K Street, N.W., Suite 375
Washington, D.C. 20005
202 383-4166
202 383-4425 (Direct)
202 383-4018 (Fax)

Bruno Maestri
Assistant Vice President
Public Affairs

Washington, DC – August 20, 1999



ADMINISTRATIVELY CONFIDENTIAL

Elaine K. Kaiser
Chief, Section of Environmental Analysis
Surface Transportation Board
1925 K Street, N.W.
Washington, DC 20243-0001

Re: Finance Docket No. 33388; CSX and NS - Control and Acquisition of Conrail

Subj: Transmittal of Norfolk Southern's (NS) Failure Mode and Effects Analysis Program Document

Dear Ms. Kaiser:

Enclosed, for your information, are five (5) copies of the Failure Mode and Effects Analysis Program document developed by Norfolk Southern to satisfy the requirements of Condition No. 6 of Appendix Q. As stipulated in Condition No. 6, NS has certified completion of this requirement to the Board under separate cover.

If you need additional information or have any questions concerning NS' compliance with this requirement, please advise.

Sincerely,

Bruno Maestri

Enclosures

NORFOLK SOUTHERN

Failure Mode and Effects Analysis Program

August 20, 1999

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EXECUTIVE SUMMARY

The Surface Transportation Board's (STB) approval of the Conrail acquisition (Decision 89, as amended by Decision 96) requires Norfolk Southern and CSX to establish a formal Failure Modes and Effects Analysis (FMEA) program to identify and prevent potential causes of accidents or hazardous materials releases at specified rail yards and intermodal facilities (Appendix Q, Condition 6).

Norfolk Southern's primary objective in preparing and conducting this FMEA program is to improve the safety of hazardous materials transportation in yards and intermodal facilities. Therefore, Norfolk Southern has elected to apply a "global" approach to achieve the greatest positive impact, voluntarily conducting analyses of hazardous material releases and accidents and identifying response actions to address the cause(s) of accidents and releases throughout its system. Norfolk Southern's expanded approach complies with and exceeds the STB's requirement set forth in Condition 6.

Norfolk Southern's program addresses two categories of failure modes: failures associated with yard accidents; and failures that occur independent of accidents, otherwise known as non-accident releases. Each failure mode is assigned a priority for response action based on analysis of its significance and frequency of occurrence. A "failure" is defined herein as the release of hazardous material to the environment. A "failure mode" is the principal mechanism of the release, e.g., the defect or method through which the hazardous material exits its container.

Norfolk Southern evaluated 604 FRA-reportable yard accidents occurring on its system, including the portions acquired from Conrail, over the years 1994 to 1998. Of these, only three yard accidents (less than one percent) involved a release of hazardous materials. Yard accidents have not been a major source of hazardous material releases. However, in keeping with the STB's directive to implement a FMEA, Norfolk Southern assumes that the potential for a hazardous materials release with adverse effects is related to the severity and frequency of each type of yard accident. Norfolk Southern has targeted switching, shoving movements (man at lead), passed couplers, failure to apply sufficient number of hand brakes, excessive buff or slack action, failure to comply with restrictive speed, and broken base of rail as yard accident failure modes for priority response action. Norfolk Southern response actions include training, efficiency checks, evaluation of operating practices and rail failure prevention efforts.

Norfolk Southern evaluated 717 non-accident releases of hazardous materials occurring on its system, including that part acquired from Conrail, over the same period. These releases are primarily less than the EPA reportable quantity of the material involved, typically involve tank cars, and are frequently the responsibility of the tank car owner or shipper. Norfolk Southern has targeted safety vent/frangible disk, manway cover gasket, bottom outlet valve, manway cover bolts, safety valve, liquid eduction valve, bottom outlet cap, packing gland nut, tank shell, liquid eduction valve plug, and other as non-accident release failure modes for priority response action. Norfolk Southern does not have direct control over the majority of these failure modes. Therefore, Norfolk Southern response actions will include directing information on each failure to the shipper and working with the North American Non-Accident Release Program and other industry groups committed to risk reduction and failure prevention.

1.0 INTRODUCTION

In July 1998, the Surface Transportation Board (STB) approved the joint acquisition of Conrail, Inc. and Consolidated Rail Corporation (collectively "Conrail") by CSX Corporation and CSX Transportation, Inc. (collectively, "CSX") and Norfolk Southern Corporation and Norfolk Southern Railway Company (collectively "NS" or "Norfolk Southern"), subject to certain conditions. Subsequent to the STB's approval, CSX and Norfolk Southern acquired control over separate portions of the Conrail rail lines. As a result of the Conrail acquisition, CSX and Norfolk Southern are able to provide more efficient and competitive service through the expansion of their individual rail networks. CSX and Norfolk Southern assumed control over their respective portions of Conrail on June 1, 1999, also known as Day One.

The STB's approval of the Conrail acquisition was based in part on a detailed review of potential environmental impacts associated with the projected rail operations. This environmental review was conducted by the STB Section of Environmental Analysis (SEA), with the assistance of many outside environmental consultants, and incorporated extensive public input. The final review, documented in the Final Environmental Impact Statement, addresses a broad range of environmental issues potentially occurring on a general (system-wide), regional, and local level. The STB concluded that, on a system-wide basis, the Conrail acquisition will bring important environmental benefits resulting from overall improvements and operating efficiencies, without significant adverse environmental impacts. However, in their approval of the Conrail Acquisition, the STB required CSX and Norfolk Southern to meet certain environmental conditions. This section describes both the STB's analyses leading to the requirements for a Failure Mode and Effects Analysis (FMEA) at specified facilities and Norfolk Southern's FMEA approach in response to STB Environmental Condition 6, which establishes the FMEA requirements applicable to certain NS rail yards and intermodal facilities.

1.1 Background

The safe transport of hazardous materials is one of the issues addressed by the STB and SEA. For the purposes of their environmental review of the transaction, the SEA defined hazardous materials as *"Any material that poses a threat to human health and/or the environment. Typical hazardous substances are toxic, corrosive, ignitable, explosive, or chemically reactive."* System-wide, the Conrail acquisition will improve the overall safe transport of hazardous materials. Railroads are the cleanest, most energy efficient and safest way to move freight, including hazardous materials. Compared to truck transport, railroads move approximately the same amount of hazardous materials with one-tenth the number of incidents.

SEA concluded in the Final Environmental Impact Statement that there would be a slight safety improvement for rail transportation of hazardous materials and no significant system-wide adverse impacts related to hazardous materials transport. This system-wide improvement results from a decrease in rail car-miles of hazardous materials associated with more efficient routings and from a reduction in hazardous materials freight-handling in rail yards due to expansion of single-line service and reduction of interchanges. The expansion of single-line service and reduction of interchange (switching) is particularly important in improving hazardous materials transportation safety. Single-line service decreases the amount of rail car switching between tracks and carriers, thereby reducing the potential for hazardous materials releases from switching activities.

On a regional and local basis, the acquisition will result in both benefits and potential impacts resulting from shifts in rail activity as CSX and NS take advantage of the reconfigured rail system. Some rail line segments, rail yards, and intermodal facilities are projected to experience a decrease in rail activity, whereas some line segments, rail yards, and intermodal facilities are projected to experience increases in rail traffic. SEA environmental analyses focused on changes in activity levels on existing rail lines and facilities to trigger further review and/or mitigation. Rail line segments and rail yards and intermodal facilities that exceeded a trigger level of increased rail activity were identified by SEA as having a potential for adverse environmental impacts. For the review of hazardous materials transportation safety, SEA defined the trigger level for rail line segments by the number of rail cars of hazardous materials transported annually and in terms of the general freight activity for rail yards and intermodal facilities. The STB established several environmental conditions on the Conrail acquisition to mitigate the potential effects of increased activity on those rail line segments, yards, and intermodal facilities that were predicted to exceed the activity thresholds.

As part of its approval of the acquisition, the STB is requiring certain measures to be taken by CSX and Norfolk Southern with respect to the post-acquisition transport of hazardous materials on rail line segments that are expected to qualify as a "Key Route" or a "Major Key Route." STB adopted the Association of American Railroads definition of a "Key Route"; e.g., a rail line segment that carries at least 10,000 cars of hazardous materials per year. The STB coined the phrase "Major Key Route" to reflect those rail line segments where hazardous materials rail car traffic would double and exceed an annual volume of 20,000 cars per year. For certain rail line segments with significant increases in hazardous materials traffic that are identified by the STB as Key Routes or Major Key Routes, Norfolk Southern has implemented various safety measures, such as installation of train defect detectors, development and distribution of local hazardous material emergency response plans, and conducting required train

inspections, and is conducting simulated emergency response drills with local emergency response organizations. The STB also identified several communities requiring additional hazardous material transport safety assistance. For these identified communities, Norfolk Southern provided and installed Operation Respond software and provided specific training in rail accident response to improve emergency response coordination and planning between the communities and the railroad. Norfolk Southern's implementation of these safety measures mitigates the potential impact from increased hazardous material traffic along these rail line segments and within these communities.

The STB also addressed rail yards and intermodal facilities which are predicted to experience a post-acquisition increase in activity above a designated threshold. To address the potential for increased hazardous materials safety risks at these facilities, STB required NS and CSX to establish a formal hazardous materials release assessment program as a condition of the acquisition of Conrail's assets. The STB's Decision 89 (as amended by Decision 96) Appendix Q, Condition 6 specifies that:

> *"Applicants shall establish a formal Failure Modes Effects Analysis (FMEA), or an equivalent program designed to identify and prevent potential causes of accidents or hazardous materials releases. Applicants shall establish such a program for the 15 rail yards and 24 intermodal facilities listed below where activity increases would meet or exceed the Board's threshold for environmental analysis, resulting in an increased potential risk of accidents and hazardous material releases. The FMEA program, or its equivalent, shall be designed to reduce the risk of hazardous material releases by identifying the potential causes and consequences of both stored and transported hazardous materials, and eliminating or reducing the likelihood of the potential causes prior to an incident. The Applicants shall certify to the Board compliance with this condition within 1 year of the effective date of the Board's final decision."*

Of the facilities listed by the STB, NS is responsible for 9 rail yards and 18 intermodal facilities, CSX is responsible for 5 rail yards and 5 intermodal facilities, and there is 1 shared rail yard and 1 shared intermodal facility. Table 1-1 lists the NS rail yards and facilities listed by the STB in Condition 6. A description of activities, a site map and a facility diagram is provided for each of the listed rail yards in Appendix A, and for each of the listed intermodal facilities in Appendix B.

Table 1.1. NS Rail Yards and Intermodal Facilities Subject to Condition 6

Facility	Location (City)	County	State	Site ID
NS Rail Yards				
Doraville	Doraville	DeKalb	Georgia	NY01
Colehour	Chicago	Cook	Illinois	NY02
Ft. Wayne	Ft. Wayne	Allen	Indiana	NY03
Luther	St. Louis	St. Louis	Missouri	NY04
Bison	Buffalo	Erie	New York	NY05
Conneaut	Conneaut	Ashtabula	Ohio	NY06
Homestead	Toledo	Lucas	Ohio	NY07
Airline	Toledo	Lucas	Ohio	NY08
Harrisburg	Harrisburg	Dauphin	Pennsylvania	NY09
NS Intermodal Facilities				
Inman	Atlanta	Fulton	Georgia	NM01
Landers	Chicago	Cook	Illinois	NM02
47th Street	Chicago	Cook	Illinois	NM03
Buechel	Louisville	Jefferson	Kentucky	NM04
Oliver	New Orleans	Orleans	Louisiana	NM05
E. Lombard St.	Baltimore	Baltimore	Maryland	NM06
Melvindale	Detroit	Wayne	Michigan	NM07
Voltz	Kansas City	Clay	Missouri	NM08
Luther	St. Louis	St. Louis	Missouri	NM09
E-Rail	Elizabeth	Union	New Jersey	NM10
Sandusky	Sandusky	Erie	Ohio	NM11
Discovery Park	Columbus	Franklin	Ohio	NM12
New AmeriPort/South Philadelphia	Philadelphia	Philadelphia	Pennsylvania	NM13
Allentown	Allentown	Lehigh	Pennsylvania	NM14
Rutherford	Harrisburg	Dauphin	Pennsylvania	NM15
Morrisville	Morrisville	Bucks	Pennsylvania	NM16
Pitcairn	Pittsburgh	Allegheny	Pennsylvania	NM17
Forrest	Memphis	Shelby	Tennessee	NM18

1.2 Purpose of Failure Mode and Effects Analysis

Failure Mode and Effects Analysis (FMEA) is a process used to assure that potential problems that are reasonably possible to predict are considered, documented, analyzed, and their causes corrected where feasible. The FMEA process is typically applied during product design and/or manufacture. The FMEA concept grew out of the aerospace industry in response to a need to assure quality and reliability in design. Modifications of the FMEA concept have since

been adapted by the automotive industry and their suppliers, the power industry, the military, and other industries.

The purpose of FMEA in this context, as described by SEA in Appendix L-1 of the Final Environmental Impact Statement, is to prevent or reduce the frequency and consequences of releases of hazardous materials. FMEA is described by SEA as a systemized set of activities intended to:

- Recognize and evaluate the potential for an incident involving hazardous material tank cars or containers and the consequences and effects of such incidents.
- Identify actions that could eliminate or reduce the likelihood of the potential incident.
- Document the FMEA process.
- Periodically review and revise the FMEA while incorporating recent incident history.

The FMEA process is viewed by SEA as a decision-making tool for addressing future corrective actions to reduce environmental safety risks associated with hazardous material spills at rail yards and intermodal facilities. SEA's description of the FMEA process in Appendix L-1 further states that although the purpose of FMEA is well defined, the specific methodology for FMEA lacks definition. The methodology should be tailored to the specific industry and processes it is analyzing.

1.3 Norfolk Southern's FMEA Approach

Safety, including safe transport of hazardous materials, is Norfolk Southern's highest priority. This unflagging commitment, which goes far beyond simply complying with existing regulations and industry practices, has resulted in Norfolk Southern's industry-leading safety performance. NS is dedicated to being a responsible member of the communities it serves and is also motivated by the tenet that safety is good business. Simply put, accidents and hazardous material releases are both damaging and expensive, and NS is devoted to preventing them. Norfolk Southern has been a strong participant in many voluntary industry and inter-industry initiatives to improve safety and enhance environmental performance by reducing the risk of hazardous materials releases and accidents.

NS's knowledge of these industry-wide issues coupled with its commitment to safety, and in particular, its commitment to safe transport of hazardous materials, led to its determination to develop and apply the FMEA program on a broader scale than required by the STB. An evaluation of NS's past history of hazardous material releases and accidents led to the conclusion that the reasons why hazardous material releases occur are typically not specific to any one facility. NS's conclusion was supported by a review of site-specific activity, location and facility information (provided in Appendices A and B) for 27 NS facilities subject to Condition 6. Although all of the nine STB-listed rail yards are projected to experience increased traffic, the rail line segments servicing six of the yards are not expected to experience a significant increase in hazardous materials transportation. Similarly, while all of the eighteen intermodal facilities (including one facility not yet in operation) are projected to experience increased traffic, the rail line segments servicing seventeen of the facilities are not expected to experience a significant increase in hazardous materials transportation.

NS's evaluations indicate train accidents in yards seldom cause a release of hazardous materials, and non-accident releases are usually the result of actions by the tank car owner or shipper, or related to the tank car design. Response actions to reduce the frequency or severity of hazardous material releases are most effective when applied throughout Norfolk Southern's operating system, e.g., across all rail yards and intermodal facilities. Therefore, Norfolk Southern has elected to apply a "global" approach to its FMEA program, applying the FMEA analyses and response actions throughout its system. Norfolk Southern's expanded approach complies with and exceeds the STB's requirement set forth in Condition 6.

Norfolk Southern's FMEA program combines a detailed review of the hazardous materials release history for NS and the portion of Conrail acquired by NS (hereafter referred to as the Northern Region) over the past five years with an evaluation of rail yard and intermodal facility activities and accidents. NS's approach addresses two distinct categories of failure modes: failures associated with train accidents in yards, or "yard accidents"; and failures that occur independent of accidents, otherwise known as non-accident releases (NARs). The evaluation of yard accidents assumes the potential for a hazardous material release, while the evaluation of non-accident releases assesses actual release events.

Analysis of the hazardous material release history and yard accident history for NS, including the Northern Region, identifies potential failure modes, as well as providing data to assess the potential severity of different types of releases, and to estimate their likelihood of occurrence. Once a failure mode and cause are identified and prioritized, NS evaluates the cause within the context of its overall rail operations and standard facility operations and activities to

identify possible NS response actions. NS response actions are aimed at reducing the frequency and/or severity of the potential failure mode by addressing the identified cause. Most response actions have a broad target, and are aimed at all NS yards or facilities, are applied system-wide across all NS operations, or are focused on issues that are not within NS's direct control. These latter issues are typically industry-wide issues, such as tank car design and construction.

Norfolk Southern's FMEA program supplements and enhances its current hazardous materials transportation safety controls and risk management efforts. The existing controls and risk management programs are discussed in detail in Section 2 of this report. They fall into three general categories: regulations; NS internal programs for safe transportation and management of hazardous materials; and voluntary railroad industry and inter-industry risk management and reduction programs. In many cases, the additional analyses performed by NS's FMEA program will identify priorities to be addressed by existing NS and/or industry programs.

As an example, NS's evaluation may identify that a potential priority failure mode is a leaking tank car valve. The likely causes identified (e.g., why does the valve leak?) could be inadequate design, insufficient maintenance, or human error (valve is not closed properly). While design of tank cars is not within NS's direct control, NS has identified a response action to work with the Association of American Railroads Tank Car Committee and other industry groups to improve tank car design and performance. Similarly, insufficient maintenance of tank cars and improper closing of valves is not within NS' control, being the responsibility of the tank car owner and shipper. However, NS has identified a two-pronged response action - (1) work with the North American Non-Accident Release Program and other industry groups to prevent non-accident releases and (2) work with tank car owners/shippers using the NS system to raise their awareness of the need for adequate tank car maintenance. Alternatively, accidents which could cause a leaking tank car valve can occur in both rail yards and intermodal facilities, and could be the direct result of train operations (switching, coupling, humping, etc.). NS's response action is directly aimed at train operations practices and could include a variety of training and awareness measures, modified rules and operating procedures, changes in maintenance practices and other controls.

Section 2 presents an overview of existing controls and risk management practices utilized by Norfolk Southern to ensure safe transport of hazardous materials. Section 3 summarizes rail yard and intermodal facility operations and activities. Section 4 reviews yard accident and non-accident release data from 1994 through 1998 for Norfolk Southern and the Northern Region. Section 5 establishes yard accident and non-accident release failure modes, and determines which failure modes warrant a priority response by Norfolk Southern based on evaluations of frequency

and severity of the potential release or accident. Section 6 analyzes the priority issues for their "root" cause, and identifies a response action(s) for each priority failure mode. Section 7 presents Norfolk Southern's plan for continuing the FMEA program into the future. Appendices A and B describe the specific NS facilities identified by the STB in Condition 6.

2.0 NORFOLK SOUTHERN HAZARDOUS MATERIALS MANAGEMENT AND TRANSPORTATION

Norfolk Southern has an important, but not controlling role in several aspects of hazardous materials transportation safety. For example, most railroad transportation of hazardous materials is in tank cars that are not owned by the railroads, but rather by leasing companies or chemical shippers. These tank car leasing companies and chemical shippers are primarily responsible for the integrity and safe operating condition of their tank cars. The safety and design features of these cars are prescribed by federal regulations and industry standards developed and maintained by the Association of American Railroads (AAR). Requirements for hazardous material shipping procedures, packaging and handling are generally determined by federal regulations.

This section presents an overview of regulatory requirements, NS' operating procedures and key programs for safely managing hazardous materials transportation, and NS' voluntary involvement in several industry-wide initiatives to improve railroad safety performance, including hazardous materials transport. These regulatory requirements, operating procedures and industry standards and programs directly affect the transport of hazardous materials through the rail yards and intermodal facilities identified by the STB in Condition 6, as well as NS operations system-wide. Much of NS' understanding of how to safely transport hazardous materials has come about through years of industry experience and technology transfer accomplished through cooperative research projects. NS' participation in these programs, which often go beyond the requirements of law, is an example of NS' proven commitment to safety and the environment, and mitigates potential local impacts of hazardous materials handling at yards and intermodal facilities.

2.1 Compliance with Applicable Rail Safety, Environmental and Worker Protection Laws

There are multiple laws and regulations which affect how hazardous materials are stored, transported, and handled; which place restrictions and reporting requirements on releases of hazardous materials to the environment; and which provide for worker protection. These rigorous requirements are the responsibility of all NS personnel, not only for regulatory compliance, but in the interest of human health and safety and the protection of the environment. It is NS' policy to comply with all applicable laws and regulations.

The federal laws are the primary source of requirements for hazardous materials storage and transportation, and employee protection. Federal law preempts state laws relating to railroad

safety (including hazardous materials transportation and storage) with very limited exception and preempts all local regulation of railroad safety. State laws relating to employee protection and release reporting typically follow the federal requirements, although individual states may have variations on certain requirements. The following is a general summary of the concepts and requirements of the key federal legislation affecting hazardous materials storage, transportation, and handling; release reporting; and worker protection requirements.

2.1.1 Federal Railroad Safety Act (FRSA)

FRSA is the federal statute under which the U.S. Secretary of Transportation prescribes, as necessary, appropriate rules and regulations for all areas of railroad safety. Comprehensive regulations have been issued by the Secretary through the Federal Railroad Administration (FRA) for track, equipment, and employee safety. Because of the paramount need for railroad safety regulation to be uniform in substance as well as enforcement, FRSA preempts any subject matter of railroad safety the Secretary has regulated to the total exclusion of local governments and in most all instances, the states. States only may impose their own railroad safety requirements (whether the same as the federal or more restrictive) if the state can pass a three-prong test: when necessary to eliminate or reduce an essentially local safety hazard; when not incompatible with any federal law, rule, regulation, order or standard; and when not creating an undue burden on interstate commerce. The FRSA preemptive umbrella extends to the hazardous materials regulations issued by the Secretary under the Hazardous Materials Transportation Act (HMTA). Thus, while it is NS' policy to cooperate with all state and local authorities, particularly with respect to spill reporting (which may be regulated by federal, state, and local environmental laws), it is NS' policy to make state and local authorities aware of the broad preemption afforded railroads under FRSA, including hazardous materials transportation and storage.

2.1.2 Hazardous Materials Transportation Act (HMTA)

The HMTA centralized the primary authority for all modes of transportation of hazardous materials with the Secretary of Transportation (e.g., Department of Transportation (DOT)). The DOT regulations govern safety aspects for hazardous materials transport, including packaging, handling, labeling, marking, placarding, and routing. Container regulations covering all aspects from manufacture to reconditions and testing are also included. HMTA regulations also establish minimum criteria for hazardous material handling, such as qualifications and training of personnel; inspection requirements; hazardous material detection equipment specifications; and safety assurance monitoring procedures. Title 49 CFR defines the materials considered

hazardous by the DOT. The FRSA broad preemption umbrella extends to state and local efforts to regulate hazardous materials transportation and storage by railroads.

The FRA is charged with developing, tracking, and enforcing DOT safety regulations pertaining to railroads, ensuring the uniform interpretation of DOT rules. FRA personnel routinely inspect Norfolk Southern facilities for compliance with DOT hazardous materials regulations.

Norfolk Southern maintains a Hazardous Materials group in its Environmental Protection Department to coordinate and facilitate compliance with these regulations. Norfolk Southern ensures familiarity and compliance with DOT hazardous materials regulations through training programs, rules exams, operating rules and practices, and timetable instructions.

2.1.3 Clean Water Act (CWA)

The CWA regulates discharges of hazardous substances to navigable waters of the United States, and provides a listing of those substances at 40 CFR 116. Reportable quantities for each hazardous substance are listed at 40 CFR 117. Each hazardous substance is categorized by a letter code (X, A, B, C, or D) associated with reportable quantities of 1, 10, 100, 1,000, or 5,000 pounds, respectively. The CWA requires discharges equal to or in excess of the reportable quantity within a 24-hour period to be reported immediately to the appropriate regulatory agency. The act establishes fines for failure to properly report hazardous substance spills. In addition, the CWA requires a Spill Prevention Control and Countermeasure (SPCC) plan and/or a Facility Response Plan (FRP) where storage of petroleum products exceeds threshold quantities.

It is Norfolk Southern policy to report and manage all spills and releases, even below the reportable quantities. NS has SPCC plans and/or FRPs at all qualifying facilities and Emergency Action Plans (EAPs) covering all rail lines and yards. (On NS' Northern Region, SPCC plans and FRPs are included in the Environmental Emergency Response Plans, a.k.a. EERPs.) These plans formalize corporate spill reporting and response procedures. NS has developed SPCC plans for both transportation and non-transportation facilities, the former subject to Coast Guard jurisdiction and the latter to the jurisdiction of the U.S. Environmental Protection Agency.

2.1.4 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

CERCLA (also known as Superfund) is focused on directing the cleanup of contaminated sites. CERCLA also broadly defines hazardous substance releases or spills to include almost all types of discharges of hazardous substances to air, land, and water. It requires that the National Response Center be notified when a release of a "reportable quantity", or RQ, has occurred. Reportable quantities are specified for a comprehensive list of chemicals in terms of the number of pounds released, and are dependant upon the relative toxicity of each chemical. Section 103 of CERCLA contains specific provisions for reporting any release equal or in excess of an RQ so that officials can evaluate the need for response action. The hazardous substance lists and the designated RQs used in CERCLA and the CWA are the same. The intent of release reporting under the CWA is to identify releases to waters of the U.S. The intent of release reporting under CERCLA is broader, e.g., to identify releases to air, water, or land. In practice, any release in excess of its RQ must be reported to the National Response Center and other appropriate agencies, and there is no substantive difference as to how releases are reported between CWA and CERCLA.

In addition, Section 304 of the Emergency Planning and Community Right-to-Know Act (EPCRA), or Title III of the Superfund Amendments and Reauthorization Act (SARA Title III), requires that timely notification be given to state and local authorities when CERCLA-listed hazardous substances and extremely hazardous substances are released in quantities equal or in excess of their RQ's. Notification must be given to the local emergency planning committee (LEPC) of any area likely affected by the release, the local fire department, and to the state emergency response commission (SERC) of any state likely affected by the release.

Another important part of CERCLA affecting hazardous materials is the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300). Generally referred to as the National Contingency Plan (NCP), the plan establishes the response action responsibilities among the federal, state, and local governments, and designates appropriate roles for private organizations such as Norfolk Southern. The NCP covers the release or substantial threat of release of hazardous substances that may be a threat to the public health and welfare.

Norfolk Southern's spill reporting practices and procedures address the requirements for notifying EPA's National Response Center and state and local authorities. Norfolk Southern fulfills its responsibilities under the NCP through its SPCC plans, FRPs, and EAPs.

2.1.5 Resource Conservation and Recovery Act (RCRA)

RCRA provides a "cradle-to-the-grave" management program for hazardous wastes, from generation to final disposition. Wastes generated from cleanup of hazardous materials releases may meet the definition of a "hazardous waste" and be subject to RCRA requirements. RCRA specifies hazardous waste handling, storage, and management procedures, including strict requirements on containers, labels, transportation manifests, and employee training. RCRA also includes a preparedness and prevention program requirement for facilities that produce or store hazardous materials and/or wastes. A RCRA contingency plan is required unless a SPCC plan is in place under the CWA. RCRA also imposes restrictions on underground storage tanks and land disposal of wastes.

Norfolk Southern has removed all known underground storage tanks at its rail yards and intermodal facilities in compliance with applicable regulations. Norfolk Southern also complies with land disposal restrictions and RCRA contingency plan requirements for all qualifying wastes and facilities.

2.1.6 Pollution Prevention Act of 1990

The Pollution Prevention Act is primarily designed to prevent pollution through source reduction, and principally affects chemical manufacturers and industrial manufacturing operations. However, owners or operators of facilities required to file a Toxic Chemical Release Inventory form under Section 313 of SARA must also include the quantities of chemicals released in one-time events not associated with production processes.

2.1.7 Occupational Safety and Health Act (OSHA)

OSHA was established to ensure that employees working in areas with recognized hazards, including chemical hazards, would be protected from these dangers. Key components of the OSHA requirements include the "Hazard Communication Standard" which requires employers to provide information on chemical hazards to their employees, including labels and Material Safety Data Sheets to inform their employees about the hazardous chemicals they handle. The standard also requires employers to provide training to ensure that their employees handle the chemical materials safely. Applicable regulations are contained in 29 CFR 1910. These regulations do not apply to hazardous materials moving in transit, which are subject to DOT regulations.

2.2 Norfolk Southern Hazardous Materials Operations and Training

Transportation of hazardous materials is safer by rail than by road. Railroads in the United States carry almost 2 million shipments carrying hazardous materials annually; roughly equivalent to almost 6 million trucks on U.S. roads. Yet, railroads have less than one-tenth the number of hazardous material incidents of trucks, despite comparable ton-mileage. (For federal reporting requirements, whenever a hazardous material leaks or spills from its container, it is considered an "incident" no matter how small the amount or minor the effect).

2.2.1 Norfolk Southern's Outstanding Safety Record

Norfolk Southern has an excellent safety record. Of the 259,993 loaded shipments of hazardous materials transported in 1998, only 83 involved incidents, most of which were minor in nature and were shipper or tank car owner-related. This equates to only 3.19 incidents per 10,000 hazardous materials shipments, most of them minor in nature.

Norfolk Southern is the undisputed safety leader within the rail industry. In fact, safety is the first element of Norfolk Southern's corporate vision: *"Be the safest, most customer-focused, and successful transportation company in the world."* To ensure its commitment to safety is followed from top to bottom, Norfolk Southern adopted its "Six Point Action Plan for Safety of Operations:"

- All injuries can be prevented.
- All exposures can be safeguarded.
- Prevention of injuries and accidents is the responsibility of each employee.
- Training is essential for good safety performance.
- Safety is a condition of employment.
- Safety is good business.

Norfolk Southern's commitment to safety is paying off. In 1998, the rate of reportable injuries was a remarkable one-fifth of what it was just ten years before and Norfolk Southern recently won the prestigious E. H. Hariman Memorial Gold Award for employee safety for the tenth straight year. Norfolk Southern has and will continue to work to improve safety performance and the protection of the environment.

2.2.2 Norfolk Southern's Environmental Policy and Programs

Norfolk Southern's environmental policy requires every employee to understand and comply with environmental requirements on the job. Public agencies are informed of any incident with the potential to cause environmental harm. Cooperation is given to all governmental/environmental authorities. All laws and regulations related to protecting the environment are complied with in full. In addition, NS sponsors numerous programs and initiatives to improve the environment. NS' resolve to be a sound environmental caretaker is reflected in its policies, and in the adoption of environmental awareness as one of seven initial projects in the company's quality improvement process. All NS employees are graduates of "Our World, Our Choice," a series of training sessions on protecting the environment and complying with environmental laws and regulations.

Norfolk Southern's Environmental Protection Department is headquartered in Roanoke, Virginia, with eleven field offices throughout the NS system. The Environmental Protection Department is divided into three sections: Environmental Operations, Remediation and Design, and Environmental Programs. The Environmental Programs section includes an Industrial Hygiene group, an Audits and Programs group, and a Hazardous Materials group. The NS hazardous materials program is coordinated by the Hazardous Materials group under the Director Environmental Programs, although any and all of the Environmental Protection Department sections may respond to a hazardous materials release, or become involved in hazardous materials management.

The Hazardous Materials group is staffed by a Manager and four Assistant Managers. In addition, there are thirteen regional Environmental Operations engineers who supplement the Hazardous Materials group for emergency response. These regional engineers focus on corporate environmental compliance and protection programs, and serve as the front line field coordinators when a hazardous materials incident develops. They also function to build a strong interactive relationship with local and state emergency response/regulatory officials in their respective territories. Also enhancing the resources available for hazardous materials management are the personnel trained on hazardous materials emergency response on the twelve Operating Divisions of NS. Representatives from Transportation, Mechanical, Engineering and Police assist safety and environmental personnel in dealing with hazardous materials incidents and promoting hazardous materials safety.

Norfolk Southern has established a Risk Management Program for Hazardous Materials in order to manage risk and reduce liabilities. The focus of this program is prevention, i.e.,

minimizing risks while maximizing employee safety and protection of the environment. Prevention is achieved within the NS system through effective training, regulatory and rules compliance, equipment and right-of-way maintenance, and risk assessment. NS also maintains detailed emergency response plans in case of a hazardous materials release, including coordination with state and local emergency responders and back-up equipment and support contracts. NS also conducts self-audits to ensure compliance with regulatory requirements and internal operating policies and procedures.

NS Hazardous Materials Training

Effective employee training is an integral part of hazardous materials release prevention. Norfolk Southern provides training in hazardous materials handling plus other pertinent aspects of rail operations (i.e., annual operating rules classes, safety, etc.) as a key element of NS' prevention program.

In 1993, in order to ensure compliance with DOT requirements for the training of all personnel involved in the transportation of hazardous materials, Norfolk Southern developed a comprehensive hazardous materials training program. Approximately 20,000 Norfolk Southern employees participated in this training program in 1993. Since then, hazardous materials refresher training has been conducted annually for transportation employees and on a regular basis as required for other "hazardous materials" employees. New employees receive the full training program for their job responsibility. Environmental awareness training is also conducted for all employees on a regular basis.

In addition, Norfolk Southern Environmental Protection Department personnel and Division representatives likely to be called to assist during a hazardous materials incident receive hazardous materials emergency response (HAZWOPER) training defined at 29 CFR 1910. The HAZWOPER program includes 40 hours of introductory emergency response training plus annual one- or two-day refresher courses. Approximately 120 NS employees have received HAZWOPER training. Although these employees are HAZWOPER trained, NS relies on the services of outside contractors for emergency response activities.

Regulatory and Rules Compliance

Complying with federal regulations and railroad operating rules (i.e., speed limits, signal aspects, etc.) are very important elements in preventing accidents and hazardous materials releases. Many of the applicable regulations and railroad practices have been incorporated into

Norfolk Southern's Corporate Policies, Operating Rules, Safety and General Conduct Rules, and Division Timetables.

Hazardous materials operating instructions are included in all NS Division Timetables. These rules address both federal regulations and NS procedures (which in certain cases are more restrictive than federal requirements) regarding switching and train placement of placarded cars, Key Trains, documentation, inspection of hazardous materials cars, marking and placarding of hazardous materials, leaking tank car and container procedures, and incident instructions and reporting.

Norfolk Southern transportation employees are provided refresher training on this information during annual operating rules classes conducted on each division. Compliance is verified by a comprehensive Operating Rules Checks Procedure, conducted by front line supervisors. Other departments conduct periodic training through regular safety rules classes and special programs.

Maintenance

Maintenance of the railroad infrastructure (track, bridges, signals, switches, etc.) and transportation equipment is an important element in preventing accidents and hazardous material releases. Most tank cars are privately owned and Norfolk Southern is not responsible for their maintenance other than ensuring safe running gear and to check for any leaks. For all railroad-owned equipment, Norfolk Southern has an effective maintenance and inspection program in place to assure it meets the required standards of safety.

Norfolk Southern has issued specific instructions to its crews governing inspection procedures for cars containing hazardous materials. These instructions are documented in NS Hazardous Materials Timetables Instructions, and require:

1. Rail cars carrying hazardous materials and each rail car immediately adjacent thereto, must be inspected before acceptance at originating point, when received in interchange, and at any point where a train is required to be inspected (including the point where the car is placed in the train). The cars may continue in transit only when the inspection indicates that the cars are in safe condition for transportation.

2. Before coupling to a placarded tank car, employees must by observation from the ground determine:

- there is no visible or detectable leak;
- all loading and unloading lines are disconnected;
- all platforms are raised or in the clear; and
- man way cover bolts, valve housing covers, bottom outlet caps and caps or plugs on other openings are in their proper places.

3. Before any closed (box or hopper) car containing hazardous materials is coupled or moved, the crew must determine that the doors are closed and securely fastened.

4. DOT specification tank cars not equipped with top and bottom shelf couplers will not be accepted in interchange, placed or pulled at industrial tracks, or moved in a train. The Mechanical Department must be notified of such cars when offered in interchange or when released from industries. This restriction applies to all DOT specification tank cars and both loaded and empty cars.

5. The safety valve and tank test due dates must be checked to make sure they are current (a car is within test until the last day of the month or year shown). These will appear on the right-hand side of the car under the specification marking.

6. Intermodal tanks containing hazardous materials must not be accepted in interchange, pulled at an industrial track, or moved in a train, unless the DOT Proper Shipping Name of the materials is clearly marked on two opposing sides of the tank. The DOT Proper Shipping Name must match the one shown on the hazardous materials shipping paper for the tank.

Derailment and Incident Investigation

As part of its safety process, NS is committed to identify the basic cause(s) of derailments and hazardous materials incidents. For events where the cause is either not readily apparent or complex, Corporate Procedures 406.1, Train Mishap Reporting, and 408.1, Hazardous Material Incident & Readiness Capability, require NS investigation of the derailment and incident. For train mishaps, NS Research and Tests assistance is requested when the root cause cannot be determined by field personnel or when the suspected cause is disputed. An experienced and trained investigator may be dispatched to the incident site to examine equipment, track, operating conditions, and other evidence, and to interview those most knowledgeable of the circumstances surrounding the incident. NS Research and Tests may also be requested to provide assistance

with regard to chemistry, identification of unknown materials, and related testing associated with hazardous materials incidents.

The investigator has extensive laboratory support facilities at his disposal to conduct accelerated service testing, failure analyses, materials composition analyses, physical testing, and other evaluations as necessary. In addition, field testing, including in-train tests, can be conducted to quantify those forces, displacements, accelerations, or other parameters that may be pertinent to the investigation.

When all relevant data and information has been acquired and analyzed, a report detailing findings and conclusions is prepared and forwarded to management. For derailments and other train mishaps, senior management is provided with a report which details the cause and recommendations for corrective actions that can be implemented to help prevent a recurrence.

Transportation Services ISO 9002 Certificate of Registration

The Eastern and Western regions of Norfolk Southern attained ISO 9002 certificates of registration, issued November 25, 1998, in recognition of developing formal quality assurance programs specific to rail freight transportation services. The Northern Region, which includes the Harrisburg, Pittsburgh, and Dearborn divisions acquired from Conrail, is expected to receive ISO 9002 certificates of registration in the near future. As a condition of certification, division facilities and personnel must exhibit objective evidence that processes are in control. The quality standard requires that up to 20 elements related to all aspects of providing transportation services be addressed. These elements are regularly reviewed via internal audits of each division conducted by trained Norfolk Southern personnel. In addition, each division is scrutinized semi-annually by an accredited auditor representing the ISO registrar. To maintain certification any nonconformances discovered during the audit processes must be addressed by documented corrective action, and the divisions must exhibit evidence of continuous quality improvement.

Risk Assessment

Risk assessment is a method of evaluating an organization's risk, bench marking current practices, prioritizing where safety improvements are needed, and identifying potential risk reduction strategies. Norfolk Southern conducts informal risk assessments of various components of its operations, including hazardous materials transport and releases as a routine part of doing business. In addition, NS participated in the development of a Quantitative Risk Assessment (QRA) Model by the Inter-Industry Rail Safety Task Force (IIRSTF).

NS Emergency Plans

Norfolk Southern maintains three types of plans to address potential transportation incidents on rail lines and facilities: *System Emergency Action Plans for Hazardous Material Incidents*; *Division Emergency Action Plans for Hazardous Materials Incidents;* and *Local Emergency Response Plans*. The System plan identifies standard operating procedures for the safe handling of hazardous materials and provides guidance to employees for responding to incidents. The Division plans focus on emergency response actions and provide special instructions and information applicable to the division and its yard, terminal, and intermodal facilities. The "local" plans provide information to local emergency response organizations to help them prepare for potential railroad incidents. The NS emergency response plans define three incident levels: I (low hazard); II (medium hazard); and III (high hazard). The plans provide instructions for determining incident levels, assigning relative degrees of severity and initiating responses. These plans are updated as necessary.

Additional emergency response resources include private, on-call contractors who provide supplemental hazardous materials handling knowledge, personnel, and equipment. These resources are located strategically through the Norfolk Southern system and are available on short notice to provide emergency support to the railroad and local emergency responders.

Spill Containment

Norfolk Southern has installed and maintained spill containment systems at various rail yards and other facilities since 1987. Spill containment systems used include a combination of fixed facility concrete basin collection systems, and manufactured spill containment pans developed by NS with Trans Environmental Systems, Inc. Over 40 spill containment pans or systems have been installed to date. Spill pan locations are selected by hazardous materials traffic density and yard car-switching activity. High density hazardous materials traffic and extensive switching of hazardous materials cars in the yards are used to identify target locations for spill pan systems. The spill pans provide specific isolation track locations within rail yards where leaking containers can be placed for controlled emergency response actions.

Hazardous Material Incident Reports

Federal regulations require all unintentional releases of hazardous materials in transportation to be reported to the DOT on the Form F 5800.1. This is in addition to initial

release reports required by federal, state, and local agencies as part of emergency response and environmental protection activities.

Customers are notified by telephone of hazardous materials incidents when they occur. If the incident involves a non-accident release (NAR) of material with minor consequences, the customer is expected to handle the response. Norfolk Southern will provide support and assistance as required, including taking steps to control the release (e.g., isolating the car, providing drip pans, etc.) pending the customer's assuming responsibility for the incident. However, in order to assure an incentive for future preventive action, the customer is expected to assume responsibility for the incident.

Customers also are provided with copies of the DOT F 5800.1 reports for hazardous materials incidents, along with supplemental environmental reports as applicable. A copy of the report typically is sent to the customer at the plant of shipment origin, with a second copy being provided to the customer's marketing division via the NS Marketing Department. This approach is employed to cultivate greater sensitivity to the needs for effective packaging and handling of hazardous commodities during rail shipments and promote greater cooperation among the parties involved.

Shipper Safety Awards

In January 1997, Norfolk Southern established the *Thoroughbred Customer Safety Award* to recognize shippers that contribute to the safe transportation of hazardous materials. The award is given to companies or plants that ship more than 1,000 car loads of hazardous materials via NS during a calendar year without a single shipper-caused incident. The program is intended to make shippers more aware of their critical role in preventing incidents, Norfolk Southern's desire to reduce shipper-caused incidents, and to stimulate shipper interest and support in safe transportation. Norfolk Southern presented 74 *Thoroughbred Customer Safety Awards* for performance during 1996 to 1998, as shown below:

Thoroughbred Customer Safety Awards

	1996	1997	1998
Corporate Awards	13	23	23
Plant Awards	4	9	2

NS Self-Audits

Norfolk Southern conducts several types of audits and internal inspections to verify compliance with DOT regulations and corporate requirements. Operating Division personnel conduct routine tests of regular operations and implementation of corporate rules and hazardous materials handling, switching, and placement rules. The NS Hazardous Materials group conducts location audits at individual facilities and regional audits, which are multiple location audits conducted consecutively in a rail corridor. These inspections are used to identify deficiencies in NS systems, infrastructure and equipment, or training, and correct them.

2.2.3 Shipment of Hazardous Materials within the NS System

As is typical of most major freight railroads, Norfolk Southern owns and operates the railroad infrastructure (e.g., main track, bridges, yards, and other facilities), and provides crews and locomotives to move trains under NS direction and dispatching. Norfolk Southern is responsible for maintenance of its infrastructure, and safe operation of its equipment and trains within its system. Some cars, including essentially all tank cars, are owned by the shipper or leased by the shipper from a third party. The tank or freight car owner is responsible for the safe operating condition of the car, including valves, gaskets, and overall integrity. Therefore, a non-accident release of hazardous materials is typically the responsibility of the car owner or shipper, not Norfolk Southern.

Cars containing hazardous materials move on Norfolk Southern only when they are accompanied by either a wheel report, which contains the proper hazardous materials description, a waybill, or the shipper's bill of lading. These documents are assembled either by the NS' Centralized Yard Operations office or the local yard office and sent to the train crews via printers or fax machines at their "on duty" point, or in the case of the shipper's bills of lading, received directly from the shipper. Train crews contact either the local yard office personnel or Centralized Yard Office personnel to verify that they have all the documents prior to departure.

Local yard offices are able to supply waybill and hazardous materials information during their hours of operation. Division dispatchers' offices also have immediate access to waybill and hazardous materials information. In addition, NS' Centralized Yard Operations or National Customer Service Center are available to supply this information on a 24-hour, 7-day basis. NS has recently implemented the Thoroughbred Yard Enterprise System (TYES), providing an interface between the way billing system in place and the hazardous materials tracking system.

Information on hazardous materials can be obtained either through the TYES, or directly from the hazardous materials inquiry or the way billing system.

NS personnel verify the standing order of trains to assure that hazardous materials cars are properly located as required by federal regulations. Also, NS train crews are required to inspect the six head cars behind the engine and the six rear cars ahead of an occupied caboose or other occupied car or locomotive to verify that placarded hazardous material cars are properly positioned.

NS' Hazardous Materials group works with the NS Customer Service Center as well as individual shippers on a regular basis to solve waybill concerns and expedite hazardous materials shipments. The Hazardous Materials group provides assistance to NS customer service representatives, NS intermodal service representatives, and customers to address waybill issues and to review approvals for intermodal service.

2.3 Industry Recommended Operating Practices and Safety Programs

Over the years, technical standards, specifications and recommended practices have been developed by independent trade organizations to standardize materials, design, fabrication, and inspection methodologies in a variety of industrial areas. These codes delineate acceptable and desirable practices an industry should follow to attain uniform quality and safety in its operations. Adherence to such codes is not mandatory unless they are specially adopted by a regulatory body. The railroad industry is supported by trade organizations which have promulgated technical standards, specifications, and recommended practices to improve safety, environmental protection, and the transport of hazardous materials.

Norfolk Southern is an active participant in these organizations and in the pursuit of higher industry standards and improved environmental performance. NS participates in and provides funding for a number of technical groups and cooperative safety and research programs in the railroad industry. NS professional staff are active in a number of technical groups whose principal purpose is to review hazardous materials and train safety issues and develop solutions that will be implemented industry-wide.

The following briefly summarizes some of the key standards voluntarily adopted by Norfolk Southern, and describes some of the continuing areas of research to improve safety and environmental performance.

2.3.1 AAR Circular OT-55

In 1989, the Inter-Industry Rail Safety Task Force (IIRSTF) was formed to review both the risk management and public communication requirements associated with the rail movement of hazardous materials. This group consists of the Association of American Railroads, the Chemical Manufacturers Association, and the Railway Progress Institute. Group I of the IIRSTF developed a series of recommended rail operating practices for transporting hazardous materials. These recommendations were issued in AAR Circular OT-55 under six main areas:

- Key Trains
- Key Routes
- Yard Operating Practices
- Storage Distances
- Training
- TRANSCAER®

Compliance with each of these areas is voluntary and not required by government regulations. However, Norfolk Southern has adopted OT-55 as part of its operating policy and practices. Key requirements of these six elements include:

Key Trains

A "Key Train" is any train with five or more carloads of materials classified as a Poison Inhalation Hazard (Zone A or B); or a combination of twenty or more carloads containing specific categories of explosives, flammable gases, poisons, or other environmentally sensitive chemicals. Key trains are identified on the train crew's shipping documents or determined by the conductor. These "Key" trains have certain operating restrictions such as a maximum speed of 50 miles per hour and constraints related to meeting and passing other trains.

Key Routes

A "Key Route" is any rail line with an annual volume of 10,000 car loads or intermodal tank loads of any hazardous materials. Key Routes are subject to specific track maintenance requirements and train defect detectors every 40 miles. Norfolk Southern has chosen to adopt certain practices more stringent that OT-55 recommendations to further enhance safety. Norfolk Southern voluntarily treats rail lines with 9,000 or more car loads of hazardous materials as "Key

Routes". In addition, NS has installed train defect detectors only 11 to 15 miles apart, on average, within the NS system.

Yard Operating Practices

The OT-55 recommends rail car switching practices that are more restrictive than certain federal regulations in limiting the number of cars of certain commodities that can be cut-off. Norfolk Southern has implemented the OT-55 practices for all rail car switching.

Another operating practice is limiting the coupling speeds of loaded placarded tank cars to no more than 4 miles per hour (mph). In the early 1990's, NS instituted a program called "Go for Four" meaning the target coupling speed should always be 4 mph or less. This program was designed to reduce the number of overspeed couplings that can cause damage to equipment and potentially loss of lading. Historically, overspeed couplings were a contributing factor in one type of hazardous material release mode (ruptured frangible disks in the safety vents of tank cars). As part of the program, coupling speed checks are performed on a regular basis in all NS hump yards and in many flat yards, using radar guns and information from the process control computer systems.

Storage Distance

OT-55 defines the minimum distance from railroad mainline tracks for storage and handling of hazardous materials. For example, when a shipper/consignee loads or unloads flammable gas, it is recommended that this activity occur no closer than 100 feet from the mainline. On Norfolk Southern, when storage or transloading of hazardous materials is permitted, a minimum of 100 feet is the preferred distance from the mainline no matter what the commodity involved.

Norfolk Southern has a general policy against transloading (e.g., loading or unloading) hazardous materials on company property. It is permitted only on a case-specific review and approval basis, and then must be covered under a lease agreement that includes spill containment measures, environmental protection language, and other requirements.

Training

OT-55 sets objectives for training operating employees (non-emergency responders) who handle hazardous materials in transportation. These operating employees are trained in

requirements for hazardous materials shipping, markings and placarding, inspection procedures for external conditions of containers, switching procedures, and placement of placarded shipments in a train. Training is also given on what to do during a hazardous materials release. In addition, training of employees (including supervisors) who handle shipments of hazardous materials on a "Key Route" is required to occur annually. All training must be documented.

TRANSCAER®

The Transportation Community Awareness and Emergency Response (TRANSCAER®) initiative is a national community outreach program to improve community awareness, emergency planning and incident response for the transportation of hazardous materials. The objectives of TRANSCAER® are as follows:

- Demonstrate the continuing commitment of chemical manufacturers and transporters to the safe transport of hazardous materials.
- Improve the relationship and communication between manufacturers, carriers and local officials of communities through which hazardous materials are transported.
- Inform LEPCs about hazardous materials moving through their communities and the safeguards that are in place to protect against unintentional releases.
- Assist LEPCs in developing emergency response plans to cope with hazardous materials transportation incidents.
- Assist community response organizations in preparations for responding to hazardous materials incidents.

2.3.2 AAR-BOE Inspections

The AAR Bureau of Explosives (AAR-BOE) has been providing expert advice on safe railroad transportation of hazardous chemicals and explosives since the first decade of this century. The BOE maintains a body of thirteen inspectors nation-wide available to the railroads to identify unsafe conditions, correct problems, provide emergency response services, train personnel in proper hazardous material rail car securement techniques and perform safety inspections of chemical shippers and railroads. On Norfolk Southern alone, since 1996, this

group has made 96 yard inspections, 10 intermodal inspections and 7 fueling facility inspections. BOE conducts its inspections with and without railroad personnel.

BOE hosts an annual 3-day conference, featuring training and instructional sessions that enable railroad hazardous materials transportation personnel to keep up with the latest developments in regulations, improvements in technology, and emergency response methods. BOE operates a hazardous materials training facility at the AAR's Transportation Technology Center. Classes are taught in hazardous materials emergency response and tank car safety. BOE provides training to chemical shipping personnel who offer tank cars for transport of hazardous materials. This latter role is of particular importance because most hazardous materials releases on NS, as on all North American railroads, are due to tank cars that have been inadequately secured by the chemical shippers or consignees before being offered to the railroad for transportation.

NS is involved in every aspect of these BOE activities, with NS staff actively participating as members of the industry steering committees that oversee BOE. NS representatives actively use the BOE forums to bring hazardous materials safety issues to the attention of the industry.

2.3.3 AAR Tank Car Committee

The AAR Tank Car Committee is the principal organization overseeing tank car design standards in North America. It plays an essential role in ensuring that tank cars are designed in a manner consistent with the railroad industry's own strict standards, as well as federal regulations. The scope of the Tank Car Committee's oversight activities addresses the details of a tank car's design and construction.

NS has a seat on the Executive Committee of the Tank Car Committee and is an active participant in its deliberations. The NS representative also serves on both of the major subcommittees of the Tank Car Committee and serves as the official liaison to the sub-committee that has responsibility for tank car accident related problems.

2.3.4 RPI-AAR Railroad Tank Car Safety Research & Test Project

The RPI-AAR Railroad Tank Car Safety Research & Test Project is a cooperative research project involving the railroads and the major tank car companies who build and own most of the cars. The project has been ongoing for almost 30 years, improving knowledge of tank car safety design. The project has studied the details of accidents and the resulting damage suffered by tank

cars. The resulting database includes records for over 30,000 damaged tank cars and enables statistical analyses of the accident performance of various aspects of different tank car designs. These analyses are used to develop means of strengthening weak points to make tank cars more damage-resistant in accidents. The RPI-AAR Tank Car Project also undertakes special engineering investigations in response to particular problems.

2.3.5 Tank Car Operating Environment Task Force

The Tank Car Operating Environment Task Force is composed of representatives from freight railroads, tank car manufacturers and owners, and chemical shippers and is working to develop a better understanding of the physical environment in which a tank car must operate. Some tank car designs have been subject to premature structural fatigue and damage that may be the result of over-speed impacts in transportation. Under some circumstances, these impacts may also cause releases of hazardous materials from the tank car safety vent. However, there is no quantitative understanding or consensus defining the tank car operating environment and how much effect it is having on any of these problems. The task force is attempting to develop data on the repair and accident related costs that can be fairly ascribed to over-speed impacts. The task force is also exploring the feasibility of a low cost data acquisition system that could be installed on tank cars that would collect information on the nature and magnitude of forces that a car in normal operating service experiences. The combined results of the effort will lead to a better understanding of tank car design requirements and of the possible need to take steps to modify the railroad operating environment.

2.3.6 Railway Technology Working Committee

Cooperative industry and government sponsored research on track structure, railroad vehicles and their interactions are guided by the Railway Technology Working Committee and its various subcommittees. The RTWC focuses on long-range goals of developing new engineering information that will benefit railroad safety. Through the activities of the RTWC and its subcommittees, engineering and scientific principles are applied to improve the railroads' understanding of how to more safely and efficiently build, maintain and operate railroads. NS is, and has been, a strong participant in the main committee and its various subcommittees and the current chairman of this committee is from NS.

2.3.7 Derailment Prevention Information Exchange Forum

The Derailment Prevention Information Exchange Forum focuses on problems and trends of an immediate nature. This group convenes monthly to exchange information on problems and potential trends. This forum is particularly important in preventing emerging problems before they become more serious. The collected observations of the railroad industry's accident prevention specialists often enables them to identify trends sooner than might otherwise be possible for an individual railroad. NS is an active participant in this group.

2.3.8 Operation Respond

Operation Respond is a program designed to improve information available to emergency responders at hazardous material and passenger train incidents. Initiated by the FRA in 1992, Operation Respond expanded and became a not-for-profit institute in 1995. Operation Respond allows emergency responders to access railroad shipping information and chemical data bases to facilitate prompt identification of potential hazardous materials in rail cars, and to determine the proper response actions. Norfolk Southern has been an active participant in Operation Respond since its expansion in 1995. NS supports the program by voluntarily providing access to the NS car records database and computer programming, and donating software to local communities throughout the NS system.

2.3.9 *Responsible Care* Partnership Program

The *Responsible Care* program was developed by the Chemical Manufacturers Association (CMA) in 1988 to help the chemical industry improve its performance in health, safety, and environmental quality. The *Responsible Care* program contains six codes of management practices:

- Community Awareness and Emergency Response Code
- Process Safety Code
- Pollution Prevention Code
- Distribution Code
- Employee Health and Safety Code
- Product Stewardship Code

Each of these codes contains specific processes and activities a participating company must address for completion of the code. Companies participating in the program commit to developing and implementing programs in accordance with the codes. CMA maintains an

application and review process prior to certifying a company as a *Responsible Care* participant. Each participating company must complete an annual self audit to illustrate progress toward fulfilling its senior management's formal commitment to *Responsible Care*. Originally developed for chemical manufacturers, CMA expanded the program to include non-CMA chemical companies, transportation suppliers, and other trade organizations.

Norfolk Southern applied for participation in CMA's *Responsible Care* in October 1996, and was approved as a *Responsible Care Partner* in March 1997. NS' program has been expanded to include the operations and facilities acquired from Conrail.

2.3.10 North American Non-Accident Release Program

Most railroad transportation releases of hazardous materials do not occur as a result of rail accidents. Instead, they occur as a result of leaks that develop, primarily from various valves and fittings on tank cars or other containers. These non-accident releases (NARs) have outnumbered accident-caused releases in the railroad industry by almost 20:1 in recent years. Although most railroad NARs occur during transportation, they are frequently due to inadequate securement of tank car fittings at the loading or unloading rack of a chemical shipper or consignee.

The North American Non-Accident Release (NAR) program is composed of representatives from hazardous material rail shippers, carriers, car owners, and trade associations who individually and collectively are committed to the objective of reducing non-accident releases from rail cars in transportation. The NAR program uses a four phase effort: (1) data collection; (2) data analysis; (3) communication of results; and (4) follow-up with shippers. All DOT F5800.1 reports that are provided to the AAR from its members are reviewed. Those meeting the definition of a non-accident release (i.e., the majority of the DOT F5800.1 reports) are entered into the NAR database. The data are reviewed on a quarterly basis. Shippers exceeding an established threshold of numbers of incidents are contacted, with detailed information provided on the nature of the leaks. Informational training and assistance is also offered to help improve securement practices used at the facility. The goal of this program is to reduce non-accident releases industry-wide by 25 percent over the first two years. Norfolk Southern is an active participant in this program.

2.3.11 AAR Hazardous Materials Risk Management Task Force

The AAR Hazardous Materials Risk Management Task Force is addressing both the technical and institutional issues attendant to applying risk assessment and management methods to railroad hazardous materials transportation safety. As the safety record for transport of hazardous materials transportation has continued to improve, it has become less apparent where the most important areas requiring attention lie. In railroad transportation, satisfactory understanding of these factors cannot be accomplished by railroads alone. Critical information from the chemical shipper and the tank car companies must be combined with railroad information on accidents to obtain the complete picture. The primary focus of the task force has been to develop consensus on the data needed to support these types of risk analyses and practical methodology for their use by the industries. This data will be the platform for future improvements in hazardous materials transportation safety.

3.0 NORFOLK SOUTHERN RAIL YARDS AND INTERMODAL FACILITIES

Norfolk Southern operations and activities at rail yards and intermodal facilities are typically consistent within each facility type. That is, operations in one NS rail yard closely resemble operations in other NS rail yards. Rail cars are handled, switched, moved, connected, and staged to build trains using standardized procedures. There may be minor variations in the flow of events due to track layout, size and yard configuration, but the activities that occur at each stage remain the same. Similarly, operations within NS intermodal facilities are also fairly consistent. Minor variations occur in layout, size, and configuration that affect traffic flow, however, the basic operation remains the same across all NS intermodal facilities.

3.1 Norfolk Southern Rail Yards

This section provides a brief description of typical operations and activities within Norfolk Southern rail yards. Appendix A describes the physical layout and key operating features of the nine rail yards addressed within this FMEA, including figures showing the rail yard and its surroundings and site layouts for each facility.

3.1.1 Rail Yard Operations

Norfolk Southern's primary business is rail transportation service, i.e., the delivery of freight by assembling and moving large numbers of rail cars coupled together with locomotives into trains. The process begins with NS picking up a loaded car or cars at an industry, intermodal facility, point of interchange with another railroad, or other point of origin. The loaded car is brought to a yard, where it (and other cars), are classified, switched, and coupled to form a train. The car is then transported as part of the train to a yard near its destination, possibly passing through several other yards on the way. In various yards along the route, the car may be switched, classified and coupled with other cars to route it to its destination yard (e.g., the yard nearest its final destination). At the destination yard, the car is delivered to an industry, intermodal facility or other point of destination and cut from the train.

Rail yards typically consist of a group or groups of parallel tracks connected by "ladders" or crossover tracks at each end to switching leads extending from each end of the track set. Additional crossovers connect the switching leads to main tracks. Switches are either hand-thrown switches or remotely-operated power switches. The set of parallel tracks may contain one or more designated thoroughfare tracks which are typically kept free of standing cars, allowing yard and road engines to move freely from one end of the yard to the other. This arrangement

enables cars to be conveniently sorted and shuffled among the yard tracks. In this way, incoming trains are broken up and made into new trains.

Large yards are typically arranged in two or more sub-yards, such as a receiving yard and a classification yard, each with a more specific purpose or operation. In addition, large yards may also include designated areas of track and other facilities for engine and car inspections, maintenance, repairs, and locomotive fueling. If inspections identify the need for repairs, the repairs are then conducted "in train" or the car is placed on a special "rip track" designated for car repairs.

Movement of Cars in the Yard

The first step in a rail car shipment occurs when a local train and crew picks up the loaded freight car at an industry track, intermodal facility, or other point of origin. The same crew may also deliver empty cars for use by shippers. Car loading operations are handled by and are the responsibility of the shipper. The loaded cars, with the necessary bills of lading, and empty cars are taken to the yard for classification. The actual pickup of cars from customers typically occurs outside the rail yard itself, although some sub-yards or industry yards are built adjacent to major customers to facilitate movement of freight.

In addition to cars picked up by local trains, cars enter the yard from other points on the railroad or from other railroads as part of an interline shipment. The yard may be used to drop off/pickup cars, or as an inspection point to comply with FRA requirements for safety inspections of trains every 500 miles.

The next step is to assemble cars from different sources into blocks of cars headed for the same destinations. Empty cars are either routed to their "home" destination or evaluated to match suitable empties (in regards to ownership, type of car, use restrictions, special equipment, etc.) against empty car orders from customers. The yard office generates a switch list instructing the yard personnel where and in what order to place cars on the tracks. These blocks of cars will then be combined into trains for the line or road haul. The assembly occurs in the yard. Movement of the cars is handled by the yard crew or switch crew, typically consisting of a yard conductor or foreman, engineer, and one or more switchmen.

Loaded and empty cars destined for delivery to industries in the district served by the yard are switched to build a local train. The local freight train is typically arranged in station order, with cars to be delivered at the first station at the head of the train followed by cars in order of

their destinations. Cars carrying hazardous materials are placed in the train outside of the normal station order when necessary to meet car placement safety requirements.

The local freight train returns from delivering rail cars with whatever rail cars were picked up from the local customers, starting the process again.

Yard Switching Operations

Yard switching operations occur as flat switching or gravity switching. In flat switching, the yard crew, using a yard engine, connects to one or more cars from one of the yard tracks, hauls the cut of cars back onto the switch lead, and then pushes, or "kicks," the cars into their assigned tracks. The crew will kick the cars loose to coast at a slow speed along their designated track until the cars connect to other cars, or reach their staging point and are stopped. The cars are stopped by the crew applying brakes, by wedge-shaped shoes (called skate retarders) placed atop the rail, or spring-loaded devices that grip the car wheels (called inert retarders). Switching is performed with due regard for the car's weight, the distance to be traveled, track grades (yard leads are often slightly higher than the center of the yard tracks, providing a slight grade to keep the cars rolling), and contents so cars couple at less than four miles per hour. The yard crew may have several cars or cuts of cars in motion at once. Cars with sensitive loads are moved into the tracks and stopped with engine attached, as are cars coupling to the sensitive load.

In gravity switching, the yard crew slowly pushes a train or cut of cars over an elevated hump. Individual cars or cuts of cars are uncoupled from the train and gain momentum rolling down the hump. A series of remotely controlled powered-switches is positioned to direct the car or cars to the selected track to assemble a block. Factoring in the weight of the car, wind direction and speed, curvature of the selected track and distance to couple, a series of retarders adjusts the speed so the car will couple at less than four miles per hour.

After the cars are in the proper tracks for their destination, it may be necessary to pull them back out and reshuffle them to place them in station order.

Switch Design and Operation

Switching refers to moving a car or cars from one track to another. The simplest switch mechanism is the turnout. The turnout is a set of slightly curved rails connecting one set of tracks to a parallel set of tracks. A turnout has two moving parts at the connection points with each set of parallel tracks. The connection points, or switch, diverts wheels from one track to

another when the points are shifted. The switch can be designed to operate by hand or can be powered and controlled remotely. The length of the turnout is determined by the speed of operation desired through the curving route. The turnout sharpness is determined by the angle of the "frog," the assembly which allows the flanged car wheels to cross over the opposite rail.

Other common types of switches are the crossover, double-slip or puzzle switch and ladder. A crossover is a pair of turnouts connecting two parallel tracks. A double slip switch combines the functions of a crossing and turnouts to allow a combination of four possible routings. A crossing carries one track across another track. The double slip switch is typically used where space is limited. A ladder track is a series of turnouts providing access to any of several parallel yard tracks.

Coupling Operation

Couplers are the mechanism by which rail cars attach together, or a car attaches to the engine. The standard coupling for general freight service is the Type E coupler, a swinging knuckle design which resembles two clasped hands. The Type E coupler works automatically when two cars are pushed together as long as one or both of the knuckles are open. When the cars are pushed together, the open knuckle(s) will swing closed and a lock drops in place and holds it closed. Built-in safety mechanisms prevent the knuckle lock from opening due to shock or vibration. To release the knuckle lock, the cars are pushed together enough to take the stress off the coupler and a coupler release lever is pulled by hand, which in turn lifts the locking pin. Uncoupling a car is also known as "cutting" the car. One knuckle opens as the cars move apart. The Type E coupler height is maintained at 31.5 to 34.5 inches above the rail, with the car either loaded or empty. The coupler knuckles are 11 inches high, providing a minimum engagement between knuckles of joined cars of 8 inches. The Type E couplers do not lock in a vertical direction.

Hazardous material tank cars and some other types of freight cars are equipped with Type F double shelf couplers which are based on the Type E swinging knuckle design. However, the Type F couplers interlock in the vertical direction as well. The Type F coupler does not allow the knuckles to slide vertically on each other. To compensate for the vertical motion as the cars move over curves in the track, the coupler is hinged. The Type F coupler reduces the potential severity of an accident by reducing the likelihood of the cars becoming separated which reduces the possibility that the end of one car will be punctured by the coupler of another car.

Retarders

Retarders are electric or electro-pneumatic devices for regulating the velocity of a car, and are typically controlled through computerized systems. The retarder itself is a set of jaws on each side of and slightly above the rails which grasp the car wheels, slowing the car to a predetermined speed. Although primarily used in hump yards, retarders may also be used in flat switching yards to control car speeds.

Departure of the Rail Car

Trains may leave directly from the classification tracks, or classified cuts may be pulled forward into a departure and forwarding sub-yard. The classified cuts are then combined into trains in station order. Road locomotives are attached, and the train prepared for departure. Typically, an end-of-train (EOT) device is mounted on the last car of the train. The EOT monitors rear-end brake-pipe pressure and transmits it to the locomotive, and is used to mark the end of train

Containers and Rail Cars used for Hazardous Materials Transport

The FRA and the Research and Special Programs Administration (RSPA) within DOT share oversight responsibility for tank car safety. The RSPA Office of Hazardous Materials Safety establishes regulations for land and air shipments of hazardous materials, and for the types of containers required, including railroad tank cars. The regulations address tank car design, construction, repair and maintenance, handling and operations by shippers and the railroads, placarding and labeling, and use in transporting various types of hazardous materials. The FRA assists RSPA in developing the regulations, and provides enforcement and technical support.

Approximately one in seven freight rail cars is a tank car, and approximately half of the tank cars in the U.S. carry materials regulated by DOT as hazardous. There are two main tank car design types: pressure and non-pressure. Non-pressure tank cars are the most common, and are used to ship liquids, both hazardous and nonhazardous materials. Pressure tank cars are used to ship liquified compressed gases, nearly all of which are classified as hazardous materials.

DOT (FRA and RSPA) sets minimum requirements for design of tank cars used for hazardous substances. The DOT specifications contain design criteria for more than three dozen tank car types to accommodate differences in the physical, chemical, and hazard characteristics of the materials shipped. The DOT regulations list hundreds of hazardous materials, and assign

each material to a hazard class according to its acute safety hazard and physical state during transport. Each hazardous material is further assigned to a specific type of approved packaging within its hazard class, including tank car types.

According to DOT regulations, most hazardous liquids can be transported in non-pressure tank cars. However, liquids posing poison inhalation hazards are restricted to pressure tank cars. Poison gases are restricted to pressure cars with head protection. The pressure tank cars provide superior puncture resistance due to their thicker walls and protected valves and fittings. Hazardous gases are assigned on an individual basis, considering volatility, toxicity, and other criteria. Flammable gases are required to be shipped in pressure cars equipped with head protection and thermal protection.

Pressure and non-pressure tank cars have several common elements: both are cylindrical-shaped tanks capped at the ends with ellipsoidal or hemispheric heads, and are typically constructed of steel. Some non-pressure tank cars are constructed of stainless steel, or aluminum or nickel alloys. The tank cars have openings fitted with valves and closures (e.g., fittings) used for loading, unloading, pressure relief, tank maintenance, and cargo monitoring. Tanks may be provided with insulation and covered with a steel jacket to control product temperature during transport. Hazardous material tank cars are required to have double-shelf couplers which provide more secure connection between cars by limiting vertical movement of the coupling. These double-shelf couplers reduce the possibility of tank cars being struck and punctured by other couplers during car switching operations or accidents.

Pressure tank cars have thicker walls for increased strength, and have additional protection for fittings. Fittings are mounted under a protective housing on top of the tank car where they are less susceptible to damage during an accident. Top fittings on non-pressure tank cars generally do not have a protective housing. Bottom fittings on DOT specification tank cars are designed so that if struck in an accident they will break off below the valve. They also are equipped with skid protection devices that further protect the bottom valve in the event of an accident. Many pressure tank cars also have additional safety features, including head protection systems to increase the puncture resistance of tank heads, and thermal protection systems to protect against overheating and rupture of the tank if exposed to fire.

3.2 Norfolk Southern Intermodal Facilities

This section provides a brief description of typical operations and activities within Norfolk Southern intermodal facilities. Appendix B describes the physical layout and key operating features of the intermodal facilities addressed within this FMEA, including figures showing the intermodal facility and its surroundings and site layouts for each facility.

3.2.1 Intermodal Operations

Intermodal traffic involves shipment of freight using more than one mode of transportation (i.e., railroad and/or truck and/or ship). The freight is carried and transferred using standardized freight containers, allowing the transfer to occur without unloading the freight. The use of standard containers greatly simplifies the operation and reduces costs. Three forms of railroad intermodal vehicle are trailer on flat car (TOFC or piggyback), container on flat car (COFC) and roadrailers (truck trailers equipped with railroad wheels and axles for rail transport).

Transfers of Freight

Railroad TOFC and COFC intermodal operations typically involve one of three methods for transferring the freight containers between rail and trucks or ships.

Circus Loading utilizes a ramp at the end of a track. Fold-down bridge plates on the ends of flatcars are used to connect the flatcars to the end ramp, forming a temporary roadway. Trailers are driven along the roadway to the end flat car until the loading/unloading is accomplished. Circus loading is typically associated with intermodal operations where only a few transfers occur daily. The method does not require much special equipment but is slow and inflexible for high volume operations.

Gantry Loading utilizes a traveling overhead crane. The crane straddles a parallel roadway and track, and lifts either containers or trailers between truck and rail. The cranes are equipped with lifting equipment for containers (lifted from the upper corners) and trailers (supported from underneath). Gantry loading is the most common method in the industry for high volume transfers of freight containers.

Side Loading involves sliding the container between the road chassis and flat car. A mobile side-loader (basically a combination crane and fork lift) is sometimes used to lift trailers

or containers. The most common current models use the same corner lock lifting and leg lifting as the gantry crane, but is mobile like a fork lift truck and can move from track to track.

TOFC and COFC shipments are usually time sensitive. Intermodal terminals or facilities are typically located on a main line so that incoming and outgoing TOFC and COFC trains do not have to move through the rail yards. With gantries, containers can be placed directly onto rail cars designated to go to a specific designation so there is no further classification necessary after loading.

NS also provides roadrailer intermodal service at Triple Crown Services (TCS) facilities. Specially equipped truck trailers pick up loads at an industry and drive to a TCS facility. Air pressure is used to elevate the truck trailer which is then backed up and lowered onto a bogie (wheel/axle/suspension unit) which is on the rail. The next truck follows this process, and after lowering onto the bogie, backs up to couple to the previous unit. This results in a unit train, consisting entirely of roadrailers coupled to a locomotive, for delivery to another TCS facility, where the process is reversed and the trailers are delivered to consignees.

Rail Equipment

Rail equipment and freight containers used in intermodal traffic are standardized across the freight industry (and internationally for containers). International shipments of freight use containers built to the specifications of the International Standards Organization (ISO), including weight and dimension requirements. The standard ISO container is 20 feet in length, although shorter and longer units in increments of 5 or 10 feet are used, up to 40 feet.

The dominant rail car for intermodal traffic is an 89-foot long flat car, capable of carrying two 40-foot long trailers or containers. This standard flat car comes in a variety of sub-classes, and can be equipped for different combinations of trailer and/or containers.

Intermodal Responsibility

There are several possible combinations of ownership and responsibility for the basic elements of intermodal freight transportation, from rail movement of trailers or containers owned by a separate motor carrier, with the railroad providing only the engine, crew, and track system, to door-to-door service by railroads themselves, using their own trucks, trailers, and containers, and making pickups and deliveries. On NS, most intermodal containers and "piggyback" truck trailers are owned by shippers. Roadrailer trailers are typically owned by TCS.

Norfolk Southern intermodal facilities are served by NS train crews providing yard movements of the rail cars. The remainder of the facility is operated by a contractor, who is responsible for providing gate guards, a crane operator, and personnel to supervise the loading/unloading. In addition, there are various equipment and service vendors accessing the facility, and truck transports and drivers.

4.0 HAZARDOUS MATERIAL RELEASE HISTORY

One of the key steps in developing this FMEA program is a review of the operating history concerning hazardous material releases at rail yards and intermodal facilities. There are two separate mechanisms for the release of hazardous materials; releases from accidents and releases that are not accident-related. Yard accidents and non-accident releases are addressed individually in this historical review for the period January 1, 1994 to December 31, 1998. Norfolk Southern selected a five-year period for review to ensure adequate data for meaningful analyses, while also reflecting reasonably current operating conditions and practices.

4.1 Yard Accidents

An analysis of yard accident data for train accidents reported to the FRA (hereafter "yard accidents") was made for accidents occurring within the period from January 1, 1994 to December 31, 1998. Freight railroads are required to report accidents to the FRA in which damages to railroad equipment, track, signals and/or structures exceeded $6,600. Reports are submitted on a standard form, FRA Form F 6180.54 - Rail Equipment Accident/Incident Report. The accident report includes information on type and cause of accident, number of cars carrying hazardous materials and their involvement in the accident, including any releases, damage assessments, train operations, rail crew activities, and other pertinent information.

Accidents reported on the FRA form are assigned a primary and contributing cause code, or failure code. The possible failure codes are organized into ten classes: Mechanical and Electrical Failures; Train Operations - Human Factors; Environmental Conditions; Loading Procedures; Highway-Rail Grade Crossing Accidents; Unusual Operational Situations; Signal and Communications; Track, Roadbed, and Structures; Other Miscellaneous; and Unknown. Each class is further separated into multiple categories and sub-categories, providing a detailed review of each accident's primary and contributing causes.

The data reviewed included both Norfolk Southern and Conrail accidents. The Norfolk Southern yard accident data includes all of NS's operations from 1994 through 1998, (hereafter referred to as NS or Eastern and Western Regions). The Conrail yard accident data were divided into two categories. The first category was defined to be the yard accidents in Conrail yards acquired by Norfolk Southern (hereafter referred to as the

Northern Region). The other category was defined to be the yard accidents in Conrail yards that have been acquired by CSX or became part of Shared Assets. Only the data corresponding to the Northern Region are included in the historical record in this report. Yard accidents belonging to CSX or Shared Assets are not included in this FMEA.

A total of 604 FRA-reportable yard accidents were identified for Norfolk Southern and the Northern Region from 1994 through 1998.

It should be noted that by using the data from accidents reported to the FRA, the analysis of yard accidents does not include small accidents that did not trigger FRA reporting requirements. For purposes of this FMEA, hazardous material releases from small accidents that did not trigger FRA reporting requirements were included in the analysis of non-accident releases. There were seven hazardous material releases from non-FRA reportable accidents included in the non-accident release analysis.

4.1.1 Hazardous Materials Releases from Yard Accidents

Hazardous materials releases from yard accidents are rare events. Within the past five years for Norfolk Southern and the Northern Region, there were a total of three yard accidents that released hazardous materials. A total of three releases in five years indicate that the average frequency of release from accidents is approximately 0.6 release from all NS and the Northern Region yard accidents per year. Hazardous materials releases occurred in 0.5 percent of all NS and Northern Region FRA-reportable yard accidents.

The first of the three hazardous materials releases from yard accidents was a release of 5,500 gallons of styrene monomer in a NS rail yard near Garlanda, Kentucky in 1996. Five cars derailed during movement in the yard due to a broken rail (failure cause T202). No injuries resulted. A cautionary evacuation of nearby homes was implemented.

The second hazardous materials release occurred on a NS main line near Lynchburg, Virginia in 1998, but is considered herein as a yard accident as the incident originated in the NS yard. A cut of cars rolled out of the yard onto the main track, colliding with a stationary, unoccupied train. The incident released approximately 10,000 gallons of acetone. There was a fire and an evacuation, but there were no injuries. The failure cause was failure to apply sufficient number of hand brakes (H020).

The third hazardous materials release attributed to a yard accident occurred within the Northern Region at Conrail's Conway hump yard in 1994. During humping operations a tank car was punctured, releasing methyl alcohol. A fire ensued. No one was injured, and no evacuations were required. The failure cause was attributed to the automatic hump retarder failing to sufficiently slow the car due to foreign material on the wheels (M407).

An examination of the three releases does not reveal any pattern to the releases with respect to time, failure cause, chemical released, or location. Although all three chemicals are within the same hazard class (DOT Hazard Class 3), there is insufficient data to reach any further conclusions regarding hazard. There were three substantially different failure causes for the three releases: T202 – Broken base of rail; H020 – Failure to apply sufficient number of hand brakes on car(s) (railroad employee); and M407- Automatic hump retarder failed to sufficiently slow rail car due to foreign material on wheels. With respect to failure cause, it appears that the few releases of hazardous materials that resulted from yard accidents occurred on a random basis over the five years covered by the evaluation.

Norfolk Southern considers all three of these releases to have been serious events. Evacuation occurred in two of the releases. There were no injuries.

Hazardous materials releases following yard accidents appear to be relatively rare in frequency and random in nature. Although the data show that the incidence of actual hazardous material releases from yard accidents is quite small (e.g., 0.5 percent), yard accidents nevertheless have the potential to cause serious failures, i.e., releases of hazardous materials. Regardless of whether hazardous materials are involved, yard accidents pose safety threats to NS employees and the public and represent a costly source of damage to NS facilities and equipment, and to freight. Therefore, consistent with the intent of STB's Condition 6, this FMEA treats yard accidents as failures, and the cause of a yard accident as the failure mode. NS assumes that the potential for a hazardous materials release with adverse effects is related to the severity and frequency of each yard accident.

4.1.2 Yard Accidents

A review was conducted of FRA-reportable yard accidents. A total of 604 yard accidents were evaluated: 352 within Norfolk Southern's pre-acquisition operations; and

252 within its new Northern Region (formerly Conrail). An effort was made to remove inconsistencies and duplications from the data. In addition, failure codes for certain of the yard accidents were modified for this FMEA evaluation based on an interpretation of the narrative contained in the FRA report. The failure codes were modified to permit the Norfolk Southern cause codes and the relevant Conrail cause codes to be condensed into one data base. This modification was made primarily with respect to failure causes H702 (switch improperly aligned) and H704 (switch previously run through). The 604 yard accidents include a total of 119 failure codes, as shown in Table 4.1.

The evaluation of the overall number of yard accidents from Norfolk Southern and the Northern Region indicates that the number of yard accidents for the entire NS operation increased over the five year period evaluated (Figure 4.1.1). Evaluation of the yard accidents also indicates that the yard accident rate (number of accidents per million yard switching miles) increased over the time period (Figure 4.1.2.). The increases in the number and rate of accidents are primarily a result of a sharp increase in yard accidents within the Northern Region, beginning in mid-1997. Part of the increase in number of accidents is also associated with a gradual increase in total switching miles on NS over the five years (Figure 4.1.3). (The yard switching miles for the Northern Region were calculated by prorating NS' portion of total Conrail yard-miles.)

Due to the limited number of hazardous material releases actually caused by yard accidents, two additional measures were considered as indicators of accident forces that could potentially result in a significant hazardous materials release. NS Engineering Systems Department maintains a data base of all NS yard accidents which includes a damage index and a severity index. The damage index evaluates yard and equipment damages (expressed as cost) associated with each accident. The severity index provides a relative ranking of the severity of each incident based on the number of cars, speed of the cars, and whether a collision occurred. These indices are existing measures presently being used by Norfolk Southern personnel to prioritize prevention efforts.

The most significant FRA-reportable yard accidents with respect to cost and severity over the five year period were identified and used to weight the consequences of various failure codes. This evaluation is discussed further in Section 5.

Table 4.1
Yard Accidents (FRA Reportable) 1994 - 1998

Failure Cause	Description	NS E&W	NS North	Total Accidents	% of Total Accidents
H702	Switch improperly aligned.	39	14	53	8.8%
H704	Switch previously run through.	37	15	52	8.6%
H307	Shoving movement, man on or at leading end of movement, failure to control.	25	5	30	5.0%
M599	Other miscellaneous causes.	23	5	28	4.6%
T110	Wide gage (due to defective or missing crossties).	13	11	24	4.0%
H312	Passed couplers	1	17	18	3.0%
E39C	Other coupler and draft system defects (car)	12	3	15	2.5%
H020	Failure to apply sufficient number of hand brakes on rail car(s) (railroad employee). *One of the NS yard accidents resulted in a hazardous material release on 3/31/98.*	14	0	14	2.3%
H306	Shoving movement, absence of man on or at leading end of movement.	5	8	13	2.2%
T311	Switch damaged or out of adjustment.	4	9	13	2.2%
S007	Classification yard automatic control system retarder failure.	12	0	12	2.0%
M505	Cause under investigation.	7	5	12	2.0%
T314	Switch points worn or broken.	5	7	12	2.0%
H503	Buffing or slacking action excessive, train handling.	0	12	12	2.0%
T305	Retarder wron, broken, or malfunctioned.	4	7	11	1.8%
H399	Other general switching rules.	3	7	10	1.7%
H303	Derail, failure to apply or remove.	7	2	9	1.5%
H601	Coupling speed excessive.	5	3	8	1.3%
H999	Other train operations/human factors.	5	3	8	1.3%
H305	Instruction to train/yard crew improper.	3	4	7	1.2%
E67C	Damaged flange or tread (build up).	5	1	6	1.0%
H021	Failure to apply hand brakes on car(s) (railroad employee).	5	1	6	1.0%
H605	Failure to comply with restrictive speed.	5	1	6	1.0%
E08C	Hand brake (including gear) broken or defective.	4	2	6	1.0%
H603	Train inside yard limits, excessive speed.	4	2	6	1.0%
M503	Vandalism of track or track appliances, e.g., objects placed on track, switch thrown, etc.	3	3	6	1.0%
T299	Other rail and joint bar defects.	1	5	6	1.0%
H211	Radio communication, improper.	5	0	5	0.8%
H525	Independent (engine) brake, improper us (except actuation).	5	0	5	0.8%
M408	Yard skate slid and failed to stop cars.	5	0	5	0.8%
T210	Head and web separation (outside joint bar limits).	4	1	5	0.8%
H313	Retarder, improper manual operation.	2	3	5	0.8%
H504	Buffing or slacking action excessive, train make up.	2	3	5	0.8%
H507	Lateral drawbar force on curve excessive, car geometry, (short car/long car combination).	0	5	5	0.8%
H799	Use of switches, other.	0	5	5	0.8%
T399	Other frog, switch and track appliance defects.	0	5	5	0.8%
T220	Transverse/compound fissure.	4	0	4	0.7%
T221	Vertical split head.	3	1	4	0.7%
H301	Car(s) shoved out and left out of clear.	2	2	4	0.7%
M502	Vandalism of on-track equipment, e. g., brakes released.	2	2	4	0.7%
T202	Broken base of rail. *One of the NS yard accidents resulted in a hazardous material release on 12/19/96.*	2	2	4	0.7%

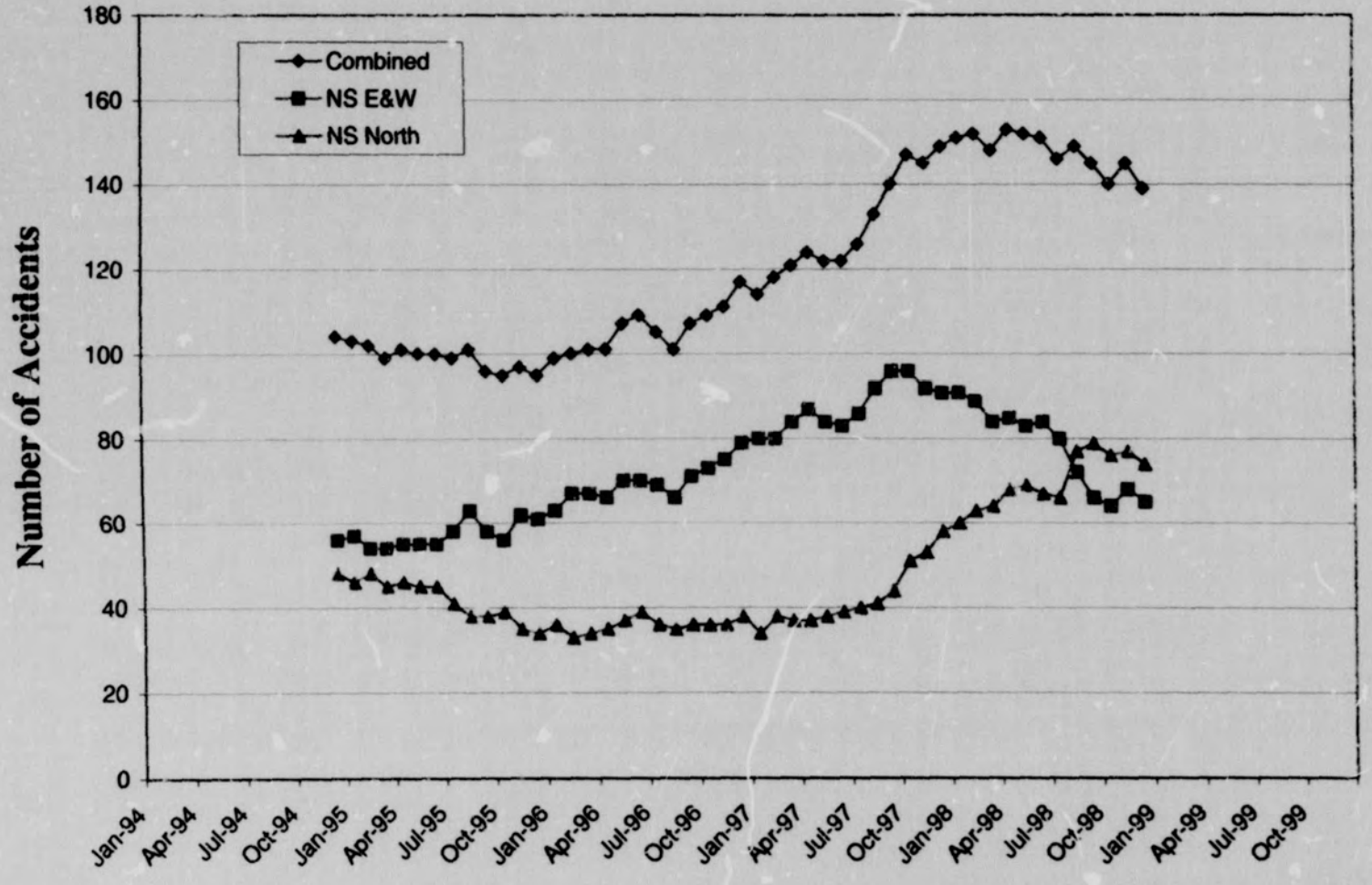
Table 4.1
Yard Accidents (FRA Reportable) 1994 - 1998

Failure Cause	Description	NS E&W	NS North	Total Accidents	% of Total Accidents
H302	Car(s) left foul.	1	3	4	0.7%
H599	Other causes relating to train handling or makeup.	1	3	4	0.7%
H703	Switch not latched or locked.	1	3	4	0.7%
T201	Bolt hole crack or break	1	3	4	0.7%
E04C	Other brake components damaged, worn, broken, or disconnected.	3	0	3	0.5%
H210	Radio communication, failure to comply.	3	0	3	0.5%
S006	Classification yard automatic control system switch failure.	3	0	3	0.5%
S011	Power switch failure.	3	0	3	0.5%
H403	Movement of engine(s) or car(s) without authority (railroad employee).	2	1	3	0.5%
M404	Object or equipment on or fouling track - other than above (for vandalism, see code M503).	2	1	3	0.5%
M407	Automatic hump retarder failed to sufficiently slow car due to foreign material on wheels of car being humped. *One of the NS North yard accidents resulted in a hazardous material release on 1/30/94.*	2	1	3	0.5%
T108	Track alignment irregular (other than buckled/sunkink).	2	1	3	0.5%
E30C	Knuckle broken or defective.	1	2	3	0.5%
H401	Failure to stop train in clear.	1	2	3	0.5%
M201	Load shifted.	1	2	3	0.5%
T102	Cross level of track irregular (not at joints).	1	2	3	0.5%
T199	Other track geometry defects.	0	3	3	0.5%
E45C	Side frame broken.	2	0	2	0.3%
M402	Object or equipment on or fouling track (motor vehicle - other than highway-rail crossing).	2	0	2	0.3%
M405	Interaction of lateral/vertical forces (includes harmonic rock off).	2	0	2	0.3%
T206	Defective spikes or missing spikes or other rail fasteners (use code T111 if results in wide gage).	2	0	2	0.3%
E07C	Rigging down or dragging.	1	1	2	0.3%
H017	Failure to properly secure engine(s) (railroad employee).	1	1	2	0.3%
M101	Snow, ice, mud, gravel, coal, etc. on track.	1	1	2	0.3%
S099	Other signal failures.	1	1	2	0.3%
T212	Horizontal split head.	1	1	2	0.3%
T313	Switch out of adjustment because of insufficient rail anchoring.	1	1	2	0.3%
H018	Failure to properly secure hand brake on car(s) (non railroad employee).	0	2	2	0.3%
H204	Fixed signal, failure to comply.	0	2	2	0.3%
H299	Other signal causes.	0	2	2	0.3%
H505	Lateral drawbar force on curve excessive, train handling.	0	2	2	0.3%
M203	Overloaded car.	0	2	2	0.3%
T109	Track alignment irregular (buckled/sunkink).	0	2	2	0.3%
T213	Joint bar broken (compromise).	0	2	2	0.3%
T217	Mismatched rail-head contour.	0	2	2	0.3%
E09C	Other brake defects, cars.	1	0	1	0.2%
E0HC	Hand brake linkage and/or connections broken or defective.	1	0	1	0.2%
E27C	Side sill broken.	1	0	1	0.2%
E31C	Coupler mismatch, high/low.	1	0	1	0.2%

Table 4.1
Yard Accidents (FRA Reportable) 1994 - 1998

Failure Cause	Description	NS E&W	NS North	Total Accidents	% of Total Accidents
F46L	Truck bolster stiff, improper lateral or improper swiveling (Locomotive).	1	0	1	0.2%
E65C	Worn tread.	1	0	1	0.2%
E89C	Other car door defects. (Provide description in narrative).	1	0	1	0.2%
H099	Use of brakes, other. (Provide description in narrative).	1	0	1	0.2%
H310	Failure to couple.	1	0	1	0.2%
H508	Improper train make-up.	1	0	1	0.2%
H518	Dynamic brake, excessive.	1	0	1	0.2%
H519	Dynamic brake, too rapid adjustment.	1	0	1	0.2%
H524	Excessive horsepower.	1	0	1	0.2%
H602	Switching movement, excessive speed.	1	0	1	0.2%
M102	Extreme environmental conditions - Tornado.	1	0	1	0.2%
M199	Other extreme environmental conditions. (Provide description in narrative).	1	0	1	0.2%
M302	Highway user inattentiveness.	1	0	1	0.2%
T111	Wide gage (due to defective or missing spikes or other rail fasteners).	1	0	1	0.2%
T112	Wide gage (due to loose, broken, or defective gage rods).	1	0	1	0.2%
T205	Defective or missing crossties (use T110 if results in wide gage).	1	0	1	0.2%
T309	Switch (hand operated) stand mechanism broken, loose, or worn.	1	0	1	0.2%
T312	Switch lug/crank broken.	1	0	1	0.2%
T403	Engineering design or contruction	1	0	1	0.2%
E08L	Hand brake (including gear) broken or defective (Locomotive).	0	1	1	0.2%
E24C	Center plate disengaged from truck (car off center).	0	1	1	0.2%
E41C	Side bearing clearance excessive.	0	1	1	0.2%
E69C	Other wheel defect (car). (Provide description in narrative).	0	1	1	0.2%
H308	Skate, failure to remove or place.	0	1	1	0.2%
H506	Lateral drawbar force on curve excessive, train make-up.	0	1	1	0.2%
H514	Failure to allow air brakes to fully release before proceeding.	0	1	1	0.2%
H521	Dynamic brake, other improper use.	0	1	1	0.2%
M204	Improperly loaded car.	0	1	1	0.2%
M205	Oversized load, misrouted.	0	1	1	0.2%
M501	Interference (other than vandalism) with railroad operations by non-railroad employee.	0	1	1	0.2%
S005	Block signal displayed false proceed.	0	1	1	0.2%
T101	Cross level of track irregular (at joints).	0	1	1	0.2%
T113	wide gage (due to worn rails).	0	1	1	0.2%
T208	Engine burn fracture.	0	1	1	0.2%
T211	Head and web separation (within joint bar limits).	0	1	1	0.2%
T216	Joint bolts, broken, or missing.	0	1	1	0.2%
T219	Rail defect with joint bar repair.	0	1	1	0.2%
T306	Retarder yard skate defective.	0	1	1	0.2%
T307	Spring/power switch mechanism malfunction.	0	1	1	0.2%
????	(Code not clear.)	0	1	1	0.2%
????	(Code not clear.)	0	1	1	0.2%
		352	252	604	100.00%

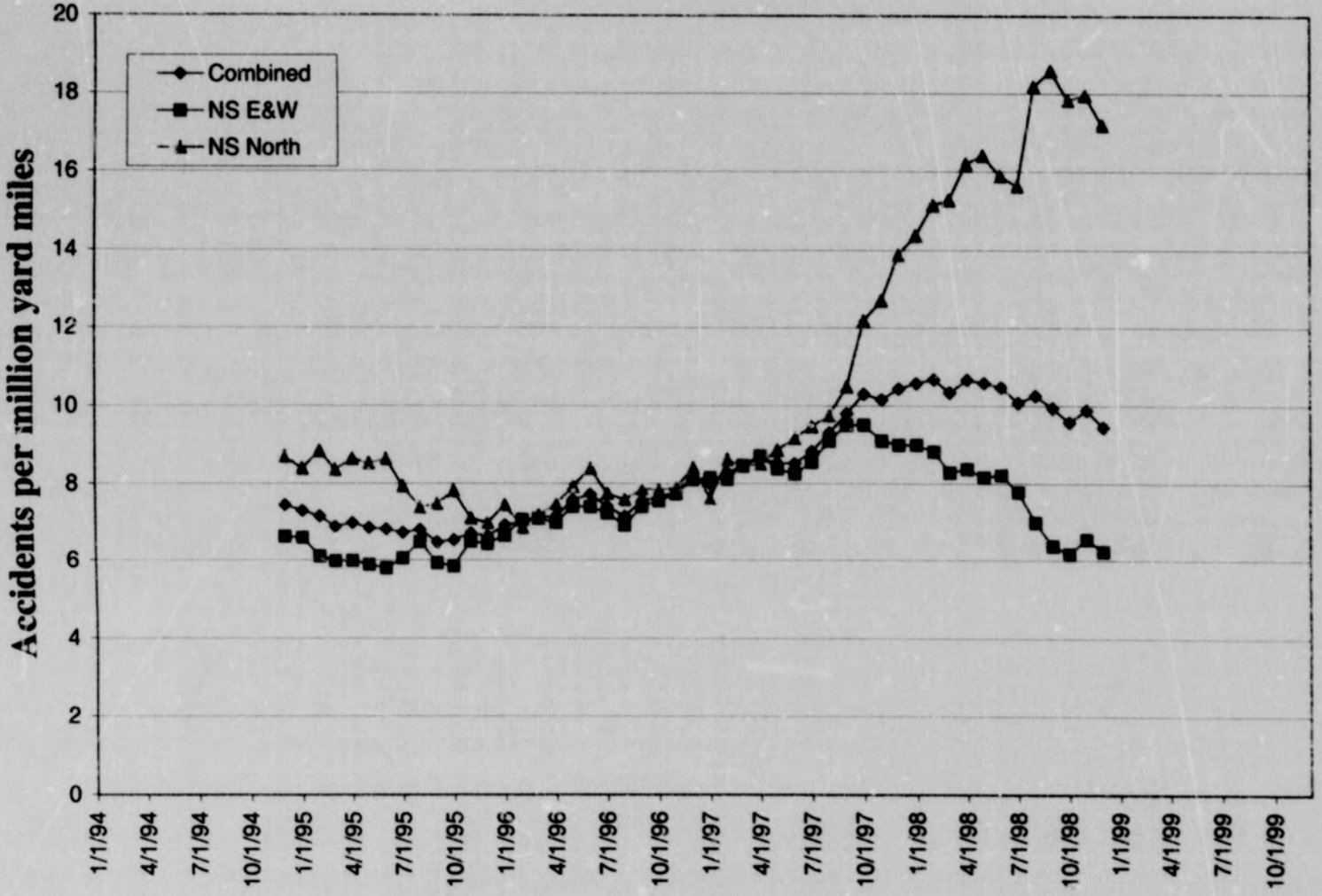
Yard Accidents
12 Month Sliding Value*



* = Each point on the figure represents the sum of accidents over the past 12 months. This smooths out random variations allowing trends to be more readily observed.

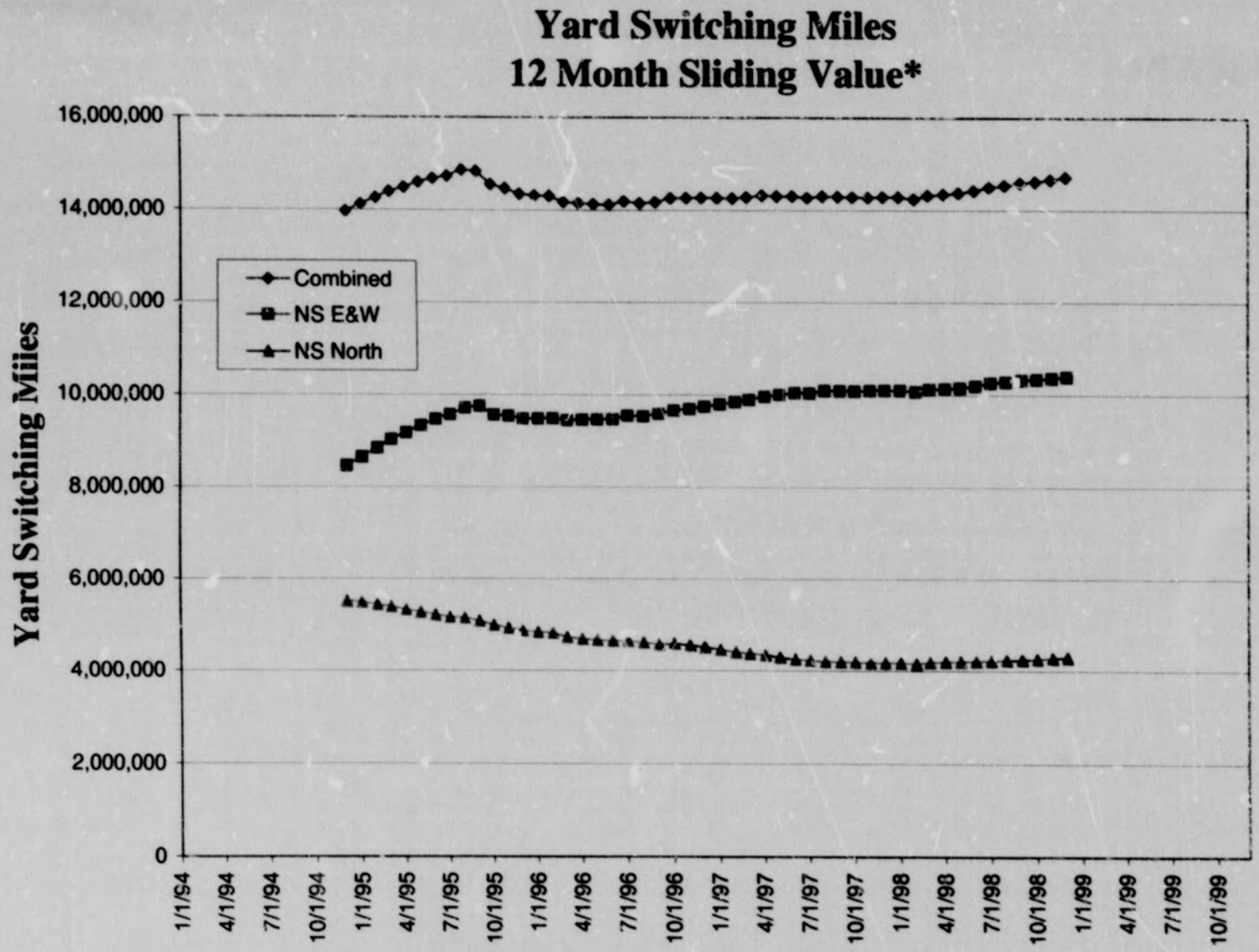
Figure 4.1.1

Yard Accident Rate
12 Month Sliding Value*



* = Each point on the figure represents the sum of the yard accident rate over the past 12 months. This smooths out random variations allowing trends to be more readily observed.

Figure 4.1.2



* = Each point on the figure represents the sum of the yard switching miles over the past 12 months. This smooths out random variations allowing trends to be more readily observed.

Figure 4.1.3

4.2 Non-Accident Releases

A review of non-accident hazardous materials release data was made for the period from January 1, 1994 to December 31, 1998. The data covered both Norfolk Southern and Conrail. Non-accident release data were acquired from Norfolk Southern, Conrail, and the Association of American Railroads. The analysis did not differentiate between the type of track (main, yard, industry, siding) involved in the release. However, most of the non-accident releases occurred or were identified within rail yards. An effort was made to eliminate duplications from the different data bases. The data in this evaluation were checked for inconsistencies between the three data bases. In general, where inconsistencies existed, information in the Norfolk Southern data base or the Conrail data base was used in preference to information in the AAR data base.

The data sources for Norfolk Southern and Conrail were the *Hazardous Materials Incident Report*, DOT Form F 5800.1. The AAR data were supplied by Norfolk Southern and Conrail from their F 5800.1 reports. The DOT F 5800.1 form provides information on releases, including: type and location of the incident, hazardous materials spilled or released, whether the reportable quantity was exceeded; whether there were fatalities or injuries requiring hospitalization, number of people evacuated, loss or property damage estimates, types of rail cars and equipment involved, transportation phase during which the incident occurred or was discovered; type of container and/or packaging; and a description of the packaging failure that created the release.

As in the yard accident analysis, the Conrail non-accident data were divided into two categories. The first category, the Northern Region, was defined to be the non-accident releases in that portion of Conrail acquired by Norfolk Southern. The second category was defined to be the non-accident releases in those portions of Conrail acquired by CSX or that became Shared Assets. Only the first category reflecting release history in the Northern Region is included in the historical record in this FMEA. Hazardous materials releases from non-accidents belonging to CSX or Shared Assets are not included in this FMEA.

The non-accident releases were divided into three categories in recognition of the basic differences in the containers and the likely failure causes: Tank Car, Intermodal Container, and Hopper Car. In addition, there were eight incidents that did not clearly fit into these categories. One was a box car release. The other seven releases involved small accidents, such as a minor derailment or a collision that were not FRA reportable and

therefore not addressed in yard accidents. All eight of these releases were included in the Tank Car category for evaluation of their significance.

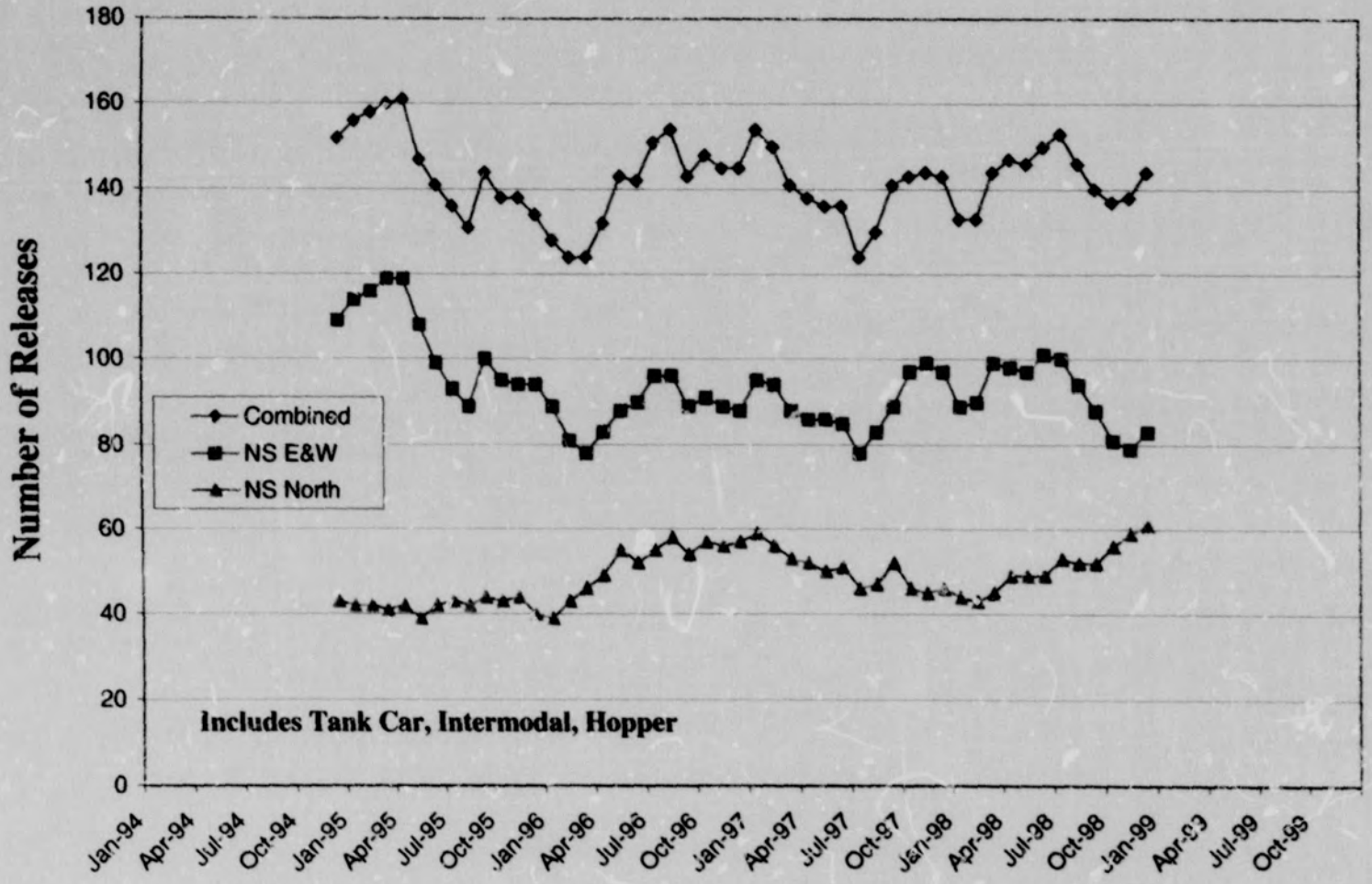
A total of 717 non-accident releases in five years were identified: 471 from Norfolk Southern's Eastern and Western Regions; and 246 from the Northern Region (formerly part of Conrail). There were 614 Tank Car releases (402 NS and 212 Northern Region), 74 Intermodal Container releases (47 NS and 27 Northern Region), and 29 Hopper Car releases (22 NS and 7 Northern Region). Tank Car releases represented 85.6 percent of the total non-accident releases. Intermodal Container releases represented 10.3 percent of the total, and Hopper Car releases represented 4.1 percent of the total. Overall, non-accident releases from Norfolk Southern showed a downward trend (see Figures 4.2.1 and 4.2.2). Releases from the Northern Region increased.

In order to identify the failure causes of non-accident releases within the Tank Car category, the North American Non-Accident Release Prevention Program Leak Location (Defect) Codes were used.

These defect codes are as follows:

A	Liquid Eduction Valve	N	Safety Vent/Frangible Disk
B	Vapor Eduction Valve	O	Other
C	Gaging Device	P	Packing Gland Nut
D	Sampling Line	Q	Unloading Valve
E	Tank Shell	R	Bottom Outlet Cap
F	Manway Cover Gasket	S	Loading Valve
G	Bottom Outlet Valve	T	Manway Cover Plate
H	Bottom Outlet Connectors	U	Manway Cover
I	Thermometer Well	V	Vacuum Relief Valve
J	Heater Coils	W	Liquid Eduction Valve Plug
K	Safety Valve	X	Vapor Eduction Valve Plug
L	Manway Cover Bolts	Y	Pipe Cap
M	Bottom Outlet Bolts	Z	Blind Flange

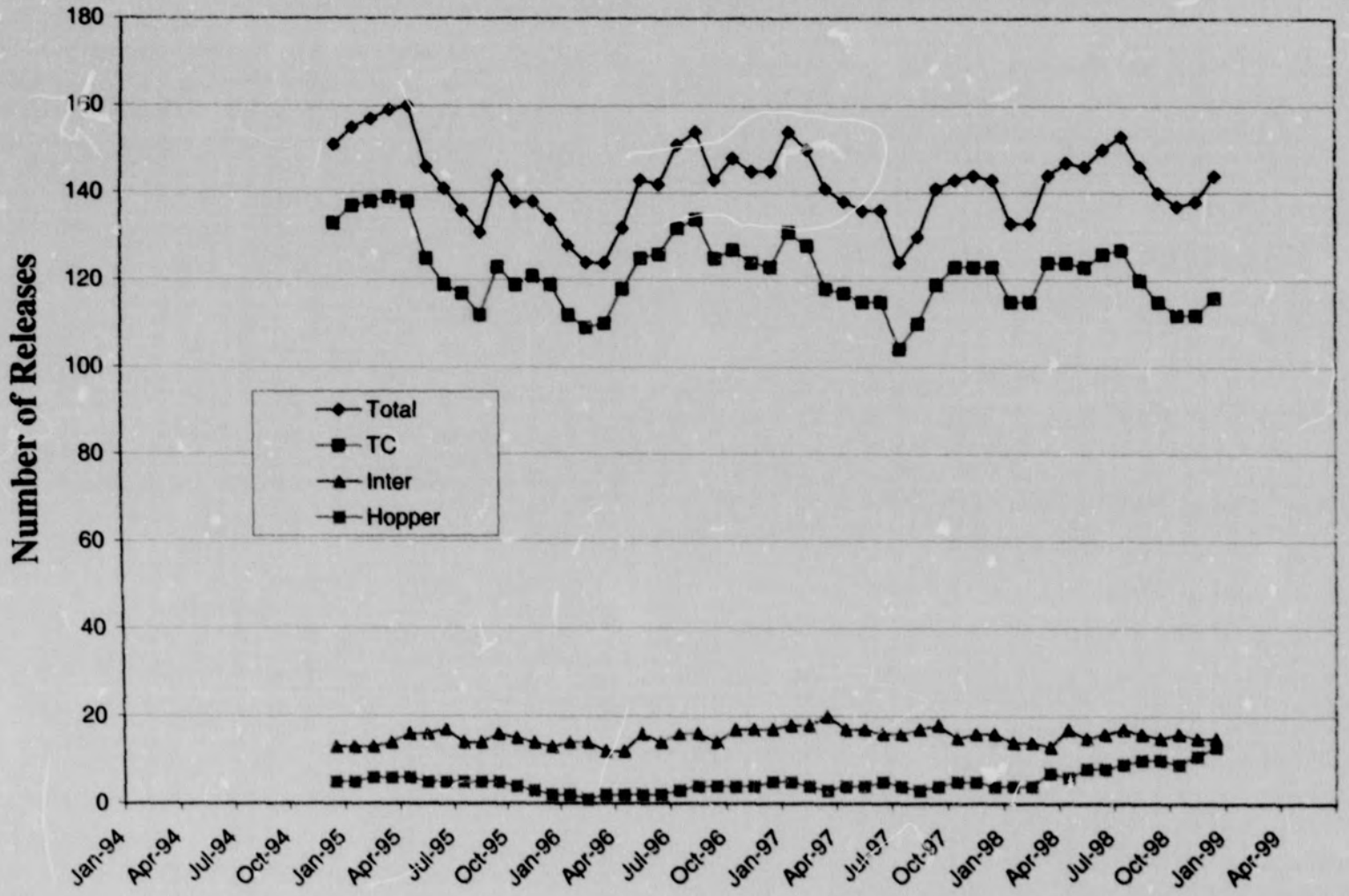
Hazardous Materials Releases - Non Accident - Total
12 Month Sliding Value*



* = Each point on the figure represents the sum of the releases over the past 12 months. This smooths out random variations allowing trends to be more readily observed.

Figure 4.2.1

Hazardous Materials Releases - Non Accident
NS E&W & NS North - Total - 12 Month Sliding Value*



* = Each point on the figure represents ths sum of the releases over the past 12 months. This smooths out random variations allowing trends to be more readily observed.

Figure 4.2.2

STB	FD	33388	8-20-99	K	FAILURE	2/4

Non-accident releases for Tank Cars that had multiple defect codes (e.g., combination codes) assigned to a single release were prorated and allocated to the respective single defect codes. That is: a double combination defect code was split in half, allocating 0.5 release to each defect code; a triple combination defect code was split in thirds, allocating 0.33 releases to each defect code. The seven small accident releases and the box car release included within the Tank Car category for evaluation were not assigned a tank car defect code.

The overall number of non-accident releases for Tank Cars was fairly stable over the time period (with a small downward trend), varying between 100-140 non-accident releases per 12 month period. Most of the non-accident releases from Tank Cars were in DOT Hazardous Materials Class 8, Corrosive Materials (40.6 percent) and Class 3, Flammable Liquids (24.4 percent). Most of the tank car failures are assigned to the top nine defect codes as shown in Table 4.2. The remainder of the failure modes occurred in only one or two percent of the total incidents, with most of the failure modes representing less than one percent of the total tank car incidents.

Most of the non-accident releases from Intermodal Containers were in DOT Hazardous Materials Class 3, Flammable Materials (47.3 percent). Intermodal Container non-accident releases rates are fairly stable over the five year time period. The commodities with the largest number of non-accident releases were alcoholic beverages and paint, both with five releases each.

Most of the non-accident releases from Hopper Cars were in DOT Hazardous Materials Class 9, Miscellaneous (62.1 percent) and Class 5.1, Oxidizer (31.0 percent). Hopper Car release rates increased over the time period. The chemical with the largest number of non-accident releases was iron sulfate (8 out of 29 releases). The non-accident releases from Hopper Cars were almost entirely due to leaks through hopper doors on the cars.

None of the non-accident releases caused a fatality or caused an injury for which hospitalization was required. There were 70 non-accident releases (66 Tank Car, 4 Intermodal Container) that triggered one or more of the other three criteria involved in evaluating the consequences of a non-accident release. Only four (3 Tank Car, 1 Intermodal Container) of the 70 non-accident releases triggered two of the criteria. None of the 70 non-accident releases triggered all three of the criteria. The three criteria are:

Table 4.2
Non-Accident Releases - Tank Cars 1994 - 1998

Defect Code	Description	NS E&W	NS North	Total Releases	% of Total Releases
N	Safety vent/frangible disk	81.50	53.83	135.33	22.3%
F	Manway cover gasket	57.67	16.83	74.50	12.3%
G	Bottom outlet valve	51.83	15.00	66.83	11.0%
O	Other	31.50	27.00	58.50	9.7%
L	Manway cover bolts	39.83	13.67	53.50	8.8%
K	Safety valve	23.33	15.50	38.83	6.4%
A	Liquid eduction valve	19.50	9.50	29.00	4.8%
R	Bottom outlet cap	20.00	8.83	28.83	4.8%
P	Packing gland nut	20.00	5.00	25.00	4.1%
E	Tank Shell	9.00	7.00	16.00	2.6%
W	Liquid eduction valve plug	11.00	5.00	16.00	2.6%
M	Bottom outlet gasket	9.50	1.50	11.00	1.8%
C	Gaging device	2.00	5.00	7.00	1.2%
V	Vacuum relief valve	3.00	4.00	7.00	1.2%
B	Vapor eduction valve	3.00	2.00	5.00	0.8%
H	Bottom outlet connectors	2.00	3.00	5.00	0.8%
Q	Unloading valve	2.00	2.83	4.83	0.8%
X	Vapor eduction valve plug	3.50	0.50	4.00	0.7%
D	Sampling line	1.00	2.50	3.50	0.6%
S	Loading valve	2.00	1.00	3.00	0.5%
U	Manway cover	0.00	3.00	3.00	0.5%
	Unknown	0.00	3.00	3.00	0.5%
Z	Blind flange	0.83	1.50	2.33	0.4%
J	Heater coils	2.00	0.00	2.00	0.3%
T	Manway cover plate	1.00	1.00	2.00	0.3%
I	Thermometer well	1.00	0.00	1.00	0.2%
Y	Pipe cap	0.00	0.00	0.00	0.0%
		398.00	208.00	606.00	100.0%

- A non-hospitalized injury incurred.
- A cautionary evacuation was ordered.
- The amount released exceeded the reportable quantity.

There were 19 releases which involved injuries to employees or the public, although none of the injuries required hospitalization. There were 8 releases in which a cautionary evacuation was ordered. There were 47 releases where the amount released exceeded the reportable quantity. It should be noted that in calculating the quantity of chemical released for comparison to the reportable quantity, NS used a worst case assumption that the quantity released was at the upper bound for quantities described as less than some amount. For example: if the quantity released was described as less than one gallon, the assumption was made that one gallon was released for purposes of comparison. Approximately half of the 47 releases considered to have exceeded their reportable quantities for purposes of this FMEA were originally documented in the incident report as "less than one gallon" of material released.

Sixty-six (66) non-accident releases from tank cars triggered at least one of the criteria above. Of the 66 releases from tank cars, three releases triggered two of the criteria. These three releases are described below.

Less than one gallon of chlorine was released near Williamsport, Pennsylvania in 1996. This was considered for purposes of this FMEA to have exceeded the reportable quantity of chlorine (10 lbs). Five people were reported with non-hospitalized injuries. No evacuation occurred. The defect code cited was O (Other).

Less than one gallon of butadiene was released near Kannapolis, North Carolina, in 1996. This was considered for purposes of this FMEA to have exceeded the reportable quantity of butadiene (1 pound). The defect code reported was K (Safety Valve). A local citizen notified the fire department of odor in the area of a rail siding. Fifteen local residents were evacuated as a safety precaution. There was a slight leak from the safety valve assembly. The leak was so small that the tank car could be moved back to its original shipping point. This was done and the tank car was unloaded.

Approximately 3,500 gallons of sulfuric acid were released near Atlanta, Georgia in 1997. This exceeded the reportable quantity of sulfuric acid (1,000 pounds). There was one non-hospitalized injury reported. No evacuation occurred. The assigned defect code was E (Tank Shell). The leak was from a one foot long crack in the side of the tank shell

(not at a seam). The contents of the tank car were transferred to tank trucks and another tank car.

Four Intermodal Container non-accident releases triggered one of the criteria described above. Only one incident triggered more than one criteria. The dominant failure cause for intermodal releases was improper blocking and bracing. The incidents are discussed below.

Vapors of diethyl ether were released near Delaplain, Kentucky in 1995. One person reported a non-hospitalized injury and 10 people were evacuated as a precaution. A five gallon drum inside the container became overheated and released vapors through a safety vent per the design. The release was less than the reportable quantity.

Less than 1 quart of terpene hydrocarbons, N.O.S., was released near Memphis, Tennessee in 1996. Five people were reported with non-hospitalized injuries, e.g., they were exposed to product vapors and were treated and released from the local hospital. A shipper's representative tightened a loose packing nut on the loading valve to stop the leak. There was no evacuation, and the release was less than the reportable quantity.

Eighteen gallons of acetone were released near Cincinnati, Ohio in 1998. This was greater than the reportable quantity of one pound. There was no evacuation or injury.

Vapors of butyl mercaptan were released near St. Louis, Missouri in 1998. One person was reported with a non-hospitalized injury; a carrier employee who smelled the product requested and was given medical attention. He was examined and released with no problem found. Product had been previously spilled inside the protective housing on top of the car during loading or unloading. There was no evacuation and the amount released was less than the reportable quantity.

No non-accident release from a Hopper Car met any of the criteria above.

5.0 FAILURE MODE AND EFFECTS ANALYSIS

Norfolk Southern's FMEA program is based on the FMEA concepts and approach described in Appendix L-1 of the Final Environmental Impact Statement prepared by SEA. NS has tailored its program to address the specific needs of NS' freight railroad operations in yards and intermodal facilities. A "failure" is defined herein as a release of hazardous materials to the environment. A "failure mode" is the principal mechanism of the release, e.g., the defect or method through which the hazardous material exits its container.

Norfolk Southern's approach addresses two distinct categories of failure modes: failures associated with yard accidents; and failures that occur independent of accidents, otherwise known as non-accident releases (NARs). Yard accidents include rail accidents in intermodal facilities. The severity of the accident is typically associated with the speed and number of the rail cars involved. Although the data show that the number of actual hazardous materials releases from yard accidents is quite small, yard accidents have the potential to cause significant failures, i.e., large releases of hazardous materials. Regardless of whether hazardous materials are involved, yard accidents are a threat to safety and represent a costly source of damage to NS facilities and equipment, and to freight.

Most railroad transportation releases of hazardous materials do not occur in accidents. Instead, they occur as a result of leaks, typically minor, that develop from various valves and fittings, or other failures on tank cars or other containers. These non-accident releases have outnumbered accident-caused releases in the railroad industry by almost 20:1 in recent years. Non-accident releases can occur in transit but are usually discovered in the yard or intermodal facility during routine inspections and car handling operations.

The following identifies the primary failure modes associated with the combined Norfolk Southern and Northern Region data for yard accidents and non-accident releases. The identified failure modes within each category are evaluated for significance and their frequency of occurrence, and priority issues are identified. Higher priorities for response actions are assigned to those failure modes with both relatively high significance and a high frequency of occurrence. The actual assessment methods used for yard accidents and non-accident releases are different due to the differences in the nature and types of past incidents. The evaluation of yard accidents focuses on the potential for a hazardous materials release, while the evaluation of non-accident releases assesses actual release events.

5.1 Yard Accidents

NS evaluated 604 FRA-reportable yard accidents that occurred over a five-year period (1994-1998) at facilities that are now part of the NS system. Of these 604 accidents, only three yard accidents (less than one percent) involved a release of hazardous materials. Yard accidents have not been a major source of hazardous materials releases. However, yard accidents are a potential source of releases. Therefore, consistent with the intent of STB's Condition 6, this FMEA treats yard accidents as failures, and the cause of a yard accident as the failure mode. NS assumes that the potential for a hazardous materials release with adverse effects is in direct relation to the severity and frequency of a yard accident.

NS evaluated yard accidents for potential hazardous material releases using an approach combining assessments of frequency severity of accidents, and known past releases, as follows:

1. The annual frequency was determined for all yard accident failure modes using the combined data set from NS and the Northern Region. Yard accident failure modes with a frequency of 2 per year or greater were reviewed further.

2. The significance of yard accident failure modes with a frequency of 2 per year or greater was evaluated using a measure of yard and equipment damages and a severity index (available for the NS accidents only). Yard accident failure modes with relatively high damage and severity rankings are identified as priority issues.

3. Yard accident failure modes with a frequency of 2 per year or greater but low significance within the NS damage and severity rating system were evaluated by comparing the numbers of accidents occurring within NS versus the Northern Region. Where the Northern Region accidents accounted for the preponderance of the accidents in a specific failure mode, that failure mode is identified as an issue to evaluate for comparison of practices.

4. Two yard accident failure modes were identified with the NS ranking system as being significant in terms of damage and severity yet having a frequency of less than two per year. Both of these failure modes are identified as priority issues for further review.

5. The failure modes associated with the three yard accidents that involved a hazardous material release were reviewed independently. Of these, two of the failure modes are identified as priority issues. The third failure mode is considered to be a low frequency, one time phenomenon.

These analytical steps are summarized in Table 5.1 and discussed in more detail below.

Table 5.1 Yard Accident Failure Modes Evaluated For Priority Response

Failure Code	Description	Frequency (Accidents per Year)	Frequency Data Dominated by Northern Region	Number of Accidents with High Damage Levels	Number of Accidents Rated Severe	Actual Release	Conclusion
Failure Modes with two or more Accidents per Year							
H702/H704	Switches.	21.0	No	10	10	No	**Evaluate.** High frequency and potential for release.
H307	Shoving movement, man at lead.	6.0	No	5	2	No	**Evaluate.** High frequency and potential for release.
M599	Other miscellaneous causes.	5.6	No	2	0	No	Do not evaluate due to miscellaneous nature of the failure cause.
T110	Wide gage (due to defective or missing crossties.	4.8	No	1	0	No	Do not evaluate due to low potential for release.
H312	Passed couplers. 17 Northern Region versus 1 NS.	3.6	Yes	0	0	No	**Evaluate.** Compare NS and Northern Region practices.
E39C	Other coupler and draft system defects (car).	3.0	No	1	1	No	Do not evaluate due to low potential for release.
H020	Failure to apply sufficient number of hand brakes.	2.8	No	4	1	Yes	**Evaluate.** High frequency and potential for release. Actual release.
H306	Shoving movement, absence of man.	2.6	No	3	1	No	**Evaluate.** High frequency and potential for release.
T311	Switch damaged or out of adjustment.	2.6	No	0	1	No	Do not evaluate due to low potential for release.
S007	Classification yard automatic control system retarder failure.	2.4	No	0	0	No	Do not evaluate due to low potential for release.
M505	Cause under investigation.	2.4	No	0	0	No	Do not evaluate due to low potential for release.
T314	Worn switch points.	2.4	No	0	0	No	Do not evaluate due to low potential for release.
H503	Buffing or slacking action excessive. 12 Northern Region versus 0 NS.	2.4	Yes	0	0	No	**Evaluate.** Compare NS and Northern Region practices.
T305	Retarder worn, broken.	2.2	No	0	0	No	Do not evaluate due to low potential for release.
H399	Other general switching rules.	2.0	No	0	0	No	Do not evaluate due to low potential for release.
Failure Modes with High Damage and Severity Ratings							
H605	Failure to comply with restrictive speed.	1.2	No	2	2	No	**Evaluate.** High potential for release. Accidents occurred in 1997 and 1998.
H525	Independent brake, improper use.	1.0	No	2	3	No	**Evaluate.** High potential for release.
Failure Modes with Prior Hazardous Material Releases							
T202	Broken base of rail.	0.8	No	1	1	Yes	**Evaluate.** Actual event. May not be a one time phenomenon.
M407	Automatic hump retarder failed to slow.	0.6	No	0	0	Yes	Do not evaluate. Consider actual release as a one time phenomenon.

Using the combined data set representing FRA-reportable yard accidents for NS and the Northern Region described in Section 4, NS summed up the number of accidents by failure code. Failure codes were determined directly from the FRA reports on the accidents, using the FRA failure codes. The yard accident data lists 119 accident causes or failure modes, with only a few causes representing more than one percent of the total accidents. No single accident cause accounted for more than nine percent of the total 604 yard accidents, and only two accident causes accounted for more than five percent of the total yard accidents.

Total accidents per failure code were divided by five (the number of years represented by the data set) to determine accidents per year. Fifteen accident causes were identified as occurring at a rate of two per year. The most frequent accident failure mode (a combination of failure code H702 and H704) involves switches, and occurs at a rate of 21 per year. The next most frequent, H307 (shoving movement, man at lead) occurs at a rate of six per year. Only one other accident failure mode, M599 (Other miscellaneous causes), occurred at a rate of more than five per year.

NS Engineering Systems Department maintains a data base of all NS yard accidents, including an evaluation of the damages associated with each accident, and a relative ranking of the severity of each incident based on the number of cars, speed of the cars, and whether a collision occurred. The yard accidents ranked as having the most damage or being the most severe, were identified. These incidents were sorted by failure mode (cause of accident) and compared to those accident failure modes with relatively high frequency. Of the 15 yard accident failure modes with a frequency rate of at least two per year, four were identified as having both relatively high frequency of occurrence and being ranked as significant. These are H702/H704 (switches), H307 (shoving movement, man at lead), H306 (shoving movement, absence of man) and H020 (failure to apply sufficient number of hand brakes).

The Northern Region data for yard accidents from the previous five years is not included within the NS system for ranking significance of accidents. Therefore, NS conducted a further review of the remaining 11 yard accident failure modes with frequency ratings of at least two per year. A comparison of the accident failure modes was conducted within each mode to identify whether the source of the accidents was primarily NS operations, Northern Region operations, or a relatively balanced combination. Accident cause categories that were dominated by the Northern Region data, e.g., a clear majority of the events occurred within the portion of the Conrail system acquired by NS, were identified as an issue for evaluation. Two such failure modes were identified: H312 (passed couplers); and H503 (buffing or slack action excessive). There were 17 accidents caused by passed couplers within the Northern Region data, yet only one within the NS data. Similarly, there were 12 accidents caused by excessive buffing or slack

action within Northern Region data, and none within the NS data. Since the Northern Region events were not analyzed for damage and severity, NS could not exclude the possibility that these failure modes were a significant issue. Therefore, these two failure modes are identified as priority issues for comparison of operating practices.

The yard accidents identified as most damaging or severe include two yard accident failure modes that are not considered frequent, e.g., they have a rate of occurrence of less than two per year. However, because of their potential for significance, both of these yard accident failure modes are identified as priority issues, subject to further review. The two failure modes are H605 (failure to comply with restrictive speed) and H525 (independent brake, improper use).

NS also evaluated the three yard accidents where an actual release of hazardous materials occurred in the past. Of these three, one failure mode, H020 (failure to apply sufficient number of handbrakes) is already identified as a priority issue due to its relative high frequency and high potential significance. The second failure mode, T202 (broken base of rail), is among the most significant accidents identified by NS. Although T202 has a low frequency of occurrence (less than one accident per year), it is identified as a priority issue due to its potential significance. The third failure mode associated with an actual hazardous materials release, M407 (automatic hump retarder failed to slow) is not rated as significant and has a low frequency of occurrence. The failure mode is primarily associated with hump yards, not flat yards, and is considered to be a one time phenomenon, not a priority issue.

Based on the analyses described above and summarized in Table 5.1, the following failure modes or yard accident causes are considered as priority issues that warrant further analyses and response action by Norfolk Southern:

H702/H704	Switches
H307	Shoving movement, man at lead
H312	Passed couplers
H020	Failure to apply sufficient number of hand brakes
H306	Shoving movement, absence of man
H503	Buffing or slacking action excessive
H605	Failure to comply with restrictive speed
H525	Independent brake, improper use
T202	Broken base of rail

5.2 Non-Accident Releases

Norfolk Southern evaluated 717 non-accident releases that occurred over a five-year period (1994 - 1998) at facilities or on lines that are now part of the NS system. These releases, reported on DOT Form F5800.1, primarily are small non-accident releases of less than the reportable quantity of the hazardous material involved, such as leaks from valves and fittings. Most non-accident releases are from tank cars. As part of the DOT Form F5800.1 reporting requirement, each tank car release is assigned one of 26 "defect" codes to identify where the failure occurred on the tank car. For the purposes of this FMEA analysis, the defect codes entered on the DOT Form F5800.1 are considered synonymous with failure mode. Where a combination of defects is identified for a single release, the release is divided by the number of defects and an equal portion assigned to each individual failure mode.

NS evaluated 717 non-accident releases, including eight releases from small accidents. Of these, 606 were releases from Tank Cars (85.6 percent of total non-accident releases). Sixty-six (66) of the releases from tank cars involved non-hospitalized injuries, cautionary evacuation, or were in excess of the reportable quantity. Based on the evaluation of the frequency and severity of non-accident releases from tank cars, failures from tank cars are considered a priority issue within this FMEA, and are addressed further below.

NS evaluated 74 non-accident releases from Intermodal Containers (10.3 percent of the total non-accident releases. Four of the 74 releases involved a non-hospitalized injury (three releases), cautionary evacuation (one release), or were in excess of the reportable quantity (one release). None of the releases involved a fatality or injury requiring hospitalization. The dominant failure cause was improper blocking and bracing within the intermodal containers. Norfolk Southern is not responsible for the blocking and bracing of materials within intermodal containers. Based on the evaluation of the frequency and severity of non-accident releases from intermodal containers, failures from such containers do not represent a high priority issue for Norfolk Southern, but are addressed in Section 6.

NS also evaluated 29 non-accident releases from Hopper Cars (4.1 percent of the total non-accident releases). None of the releases from hopper cars involved a fatality, injury, evacuation, or were in excess of the reportable quantity. The non-accident releases from hopper cars were almost entirely due to leaks through the hopper doors on the cars. Based on the evaluation of the frequency and severity of non-accident releases from hopper cars, failures from hopper cars do not represent a priority issue within this FMEA.

A total of 26 failure modes are identified for tank car releases. Of these, one failure mode, Defect Code N (safety vent/frangible disk), accounts for 22.3 percent of the total number of combined releases. Other failure modes with relatively large numbers of failures include: Defect Code F (manway cover gasket) at 12.3 percent; Defect Code G (bottom outlet valve) at 11.0 percent; Defect Code O (other) at 9.7 percent; and Defect Code L (manway cover bolts) at 8.8 percent. These data are consistent with national industry data for hazardous materials releases. Most hazardous materials transported by national freight railroads are carried in tank cars; therefore, it is not surprising that tank cars are the source of most hazardous materials non-accident releases. The remainder of the discussion of non-accident releases addresses only tank car releases.

Frequency of occurrence represents the likelihood of a release occurring from a specific failure mode, ranked on a scale of one to five. This is a qualitative ranking based on a review of the Norfolk Southern and Northern Region release data. Evaluation criteria used to determine the likely frequency of occurrence for non-accident releases are shown below:

Occurrence Rating	Evaluation Criteria
5	Greater than 20 releases per year.
4	Greater than 10 but less than or equal to 20 releases per year.
3	Greater than 5 but less than or equal to 10 releases per year.
2	Greater than 2 but less than or equal to 5 releases per year.
1	Less than or equal to 2 releases per year.

The evaluation criteria are based on a qualitative analysis of the numbers of releases and corresponding failure modes in the non-accidental release categories.

The "significance" of a hazardous materials release is a qualitative rating of the potential effects of the failure on human health and safety and the environment. The effects of a failure range from no environmental impact or personal injury to a significant risk of adverse environmental impact or fatality. The severity or significance of prior hazardous materials releases from the non-accident releases was evaluated and assigned a rating of 1 to 5, with 5 representing a higher level of significance. The following presents the level of significance for hazardous materials releases from non-accident releases.

Severity Rating	Evaluation Criteria
5	Fatality to member of public or employee.
4	Injury to member of public or employee requiring hospitalization.
3	Injury to member of public or employee not requiring hospitalization, or cautionary evacuation of public facilities/property.
2	Release of hazardous materials in excess of reportable quantity (RQ).
1	Release of hazardous materials less than the RQ.

The potential significance of each failure mode for non-accident releases is determined by applying the criteria shown above to each release within each failure mode category. Each release is rated for significance by assigning the highest rating applicable to the release. For example, a minor release of hazardous materials, below the RQ and with no injuries, evacuations, or fatalities, is rated as having a significance of "1". A release that exceeded the RQ and resulted in a hazardous materials-caused injury requiring hospitalization would be rated as having a significance of "4". The overall potential significance of the failure mode is then identified by taking the highest significance rating of the releases assigned to a particular failure mode. For example, within the failure mode Defect Code N (safety vent/frangible disk) there are a total of 135.33 releases with four releases resulting in injuries to personnel not requiring hospitalization plus one release in excess of the RQ. The highest significance rating for an individual release is 3 for the injuries not requiring hospitalization. Accordingly, the entire failure mode is rated as 3 for level of significance.

This approach to determining significance is based on analyses of past release history. This approach assumes that if a past release had a specific adverse effect, such a release and adverse effect could happen again within that failure mode. The highest level of significance (e.g., worst case event) for an individual release within a failure mode is used to represent the potential significance of the failure mode as a whole. If a release has not had a specific adverse effect (e.g., no fatalities or injuries requiring hospitalization), it is assumed that such an effect is unlikely.

Non-accident release failure modes are ranked according to their priority for response action by Norfolk Southern. The significance rating (S) is multiplied by the frequency of occurrence rating (O) for each failure mode, resulting in a response priority number (RPN).

$$RPN = (S)\ (O)$$

The RPN range is 1 through 25, with higher RPN's indicating a higher priority. The RPN is somewhat subjective, being based on qualitative rankings for significance and frequency of occurrence. Nonetheless, the RPNs provide a decision-making tool for focusing Norfolk Southern's resources to reduce the severity or frequency of hazardous materials releases. Table 5-2 presents the non-accident release failure modes rated by frequency of occurrence, level of significance, and their resulting response priority.

Non-accidental release failure modes with an RPN of 6 or greater are considered to have a higher priority for response action by Norfolk Southern. The priority failure modes for non-accident releases include:

Defect Code	Description
N	Safety vent/frangible disk
F	Manway cover gasket
G	Bottom outlet valve
O	Other
L	Manway cover bolts
K	Safety valve
A	Liquid eduction valve
R	Bottom outlet cap
P	Packing gland nut
E	Tank shell
W	Liquid eduction valve plug

Table 5.2
Evaluation of Tank Car Non Accident Releases

Defect Code	Description	Number of Releases	%	Releases per year	Occurrence Rating (O)	High Consequence	Severity Rating (S)	Priority Rating (RPN)
N	Safety vent/frangible disk	135.33	22.3%	27.1	5	4 Non-Hosp 1 greater than RQ	3	15
F	Manway cover gasket	74.50	12.3%	14.9	4	2 Non-Hosp 4 greater than RQ	3	12
G	Bottom outlet valve	66.83	11.0%	13.4	4	9 greater than RQ	2	8
O	Other	58.50	9.7%	11.7	4	4 Non-Hosp 1 Evac 5 greater than RQ	3	12
L	Manway cover bolts	53.50	8.8%	10.7	4	1 Non-Hosp 4 greater than RQ	3	12
K	Safety valve	38.83	6.4%	7.8	3	1 Non-Hosp 1 Evac 2 greater than RQ	3	9
A	Liquid eduction valve	29.00	4.8%	5.8	3	2 greater than RQ	2	6
R	Bottom outlet cap	28.83	4.8%	5.8	3	5 greater than RQ	2	6
P	Packing gland nut	25.00	4.1%	5.0	2	1 Evac	3	6
E	Tank Shell	16.00	2.6%	3.2	2	1 Non-Hosp 1 Evac 4 greater than RQ	3	6
W	Liquid eduction valve plug	16.00	2.6%	3.2	2	1 Non-Hosp 2 Evacs 2 greater than RQ	3	6
M	Bottom outlet gasket	11.00	1.8%	2.2	2	1greater than RQ	2	4
C	Gaging device	7.00	1.2%	1.4	1	less than RQ	1	1
V	Vacuum relief valve	7.00	1.2%	1.4	1	less than RQ	1	1
H	Bottom outlet connectors	5.00	0.8%	1.0	1	1greater than RQ	2	2
B	Vapor eduction valve	5.00	0.8%	1.0	1	less than RQ	1	1
Q	Unloading valve	4.83	0.8%	1.0	1	less than RQ	1	1
X	Vapor eduction valve plug	4.00	0.7%	0.8	1	less than RQ	1	1
D	Sampling line	3.50	0.6%	0.7	1	less than RQ	1	1
S	Loading valve	3.00	0.5%	0.6	1	1 Evac	3	3
U	Manway cover	3.00	0.5%	0.6	1	1 greater than RQ	2	2
	Unknown	3.00	0.5%	0.6	1	less than RQ	1	1
Z	Blind flange	2.33	0.4%	0.5	1	less than RQ	1	1
J	Heater coils	2.00	0.3%	0.4	1	less than RQ	1	1
T	Manway cover plate	2.00	0.3%	0.4	1	less than RQ	1	1
I	Thermometer well	1.00	0.2%	0.2	1	less than RQ	1	1
Y	Pipe cap	0.00	0.0%	0.0	1	NA	1	1
		606.00	100.0%	121.2				

6.0 FAILURE CAUSES AND RESPONSE ACTIONS

This section evaluates the root causes of the yard accident and non-accident release failure modes identified as priority issues and discusses what actions NS has taken and will take to address the causes in order to reduce the frequency and/or severity of hazardous materials releases in yards and intermodal facilities.

6.1 Yard Accidents

Ten FRA failure codes identified as priority issues in this FMEA are categorized below into eight failure modes. They are predominantly from FRA's Train Operations (H) categories with one from the Track and Roadbed (T) category. Train operations categories relate to all aspects of train operations and are divided into human factors, equipment (mostly switches), and rules(or procedural) failures. Each failure mode is presented in order of priority and includes the description of the FRA failure code(s), a discussion of the cause(s) of failure and a discussion of response action(s).

In many cases, Norfolk Southern's focus on safety and accident prevention efforts have already resulted in response actions to control and reduce the causes of yard accidents. For example, severe failures are evaluated on an ongoing basis, often resulting in rapid implementation of response actions. In addition, every year while preparing annual safety, rules and procedures training programs, Norfolk Southern's Operating Rules group and Hazardous Materials group review failures, violations and problem areas to identify topics for coverage in training and awareness.

6.1.1 H702/H704 - Switches Improperly Aligned (H702) or Previously Run Through (H704)

This failure mode is for accidents that occur when a train runs through a switch that is not aligned with the movement, which can damage the switch, and for accidents caused by switches improperly aligned and/or damaged from a previous run-through. These two codes have been grouped as one failure mode because they overlap both in cause and response action. This failure mode has the highest frequency of occurrence and the highest frequency of severe and costly incidents, but has not been the cause of any hazardous materials incidents on NS or the Northern Region during the five-year period 1994 through 1998.

Cause: This failure mode is caused by failure to comply with NS Operating Rule 104(a) or NORAC Rule 104(g). In many cases, it appears employees correctly align the first switch required for a switching move and then initiate train movement, failing to identify the need to align subsequent switches for the move.

Response Action: Norfolk Southern's Operating Rules group has identified this issue as a priority and implemented response actions. NS training programs address this rule and the need to identify all switches requiring alignment before initiating a move. These issues have been covered in NS training videos and in NS classroom sessions in the annual Transportation Department rules classes since 1997. This practice has also been covered in efficiency tests on selected NS operating divisions. As seen in Figure 6.1.1, these response actions have reduced the frequency of yard accidents from H702 approximately 70% between late 1997 and January 1999 on the Eastern and Western Regions. The frequency rate for H704 has not changed appreciably since late 1997, as shown in Figure 6.1.2.

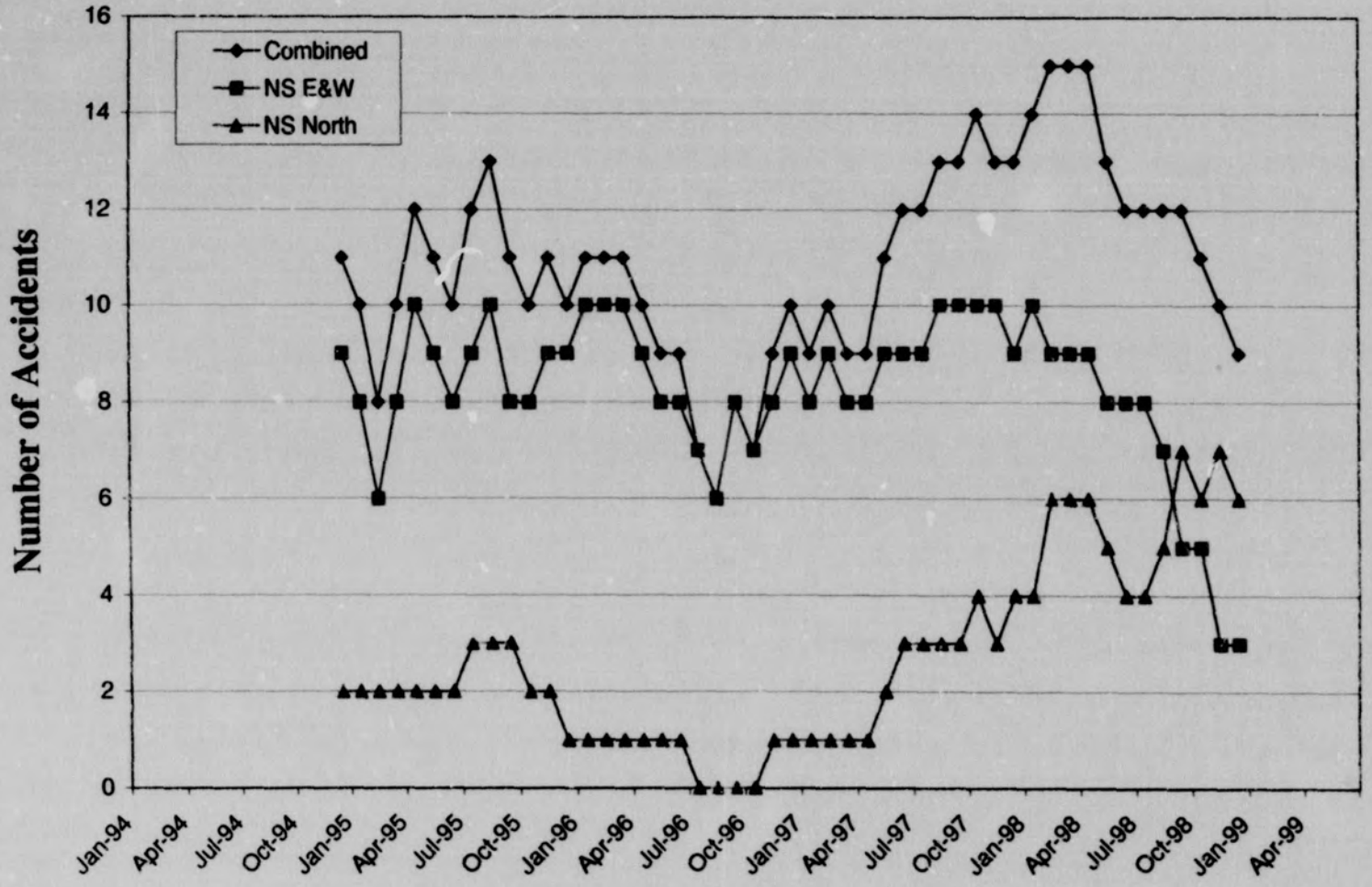
NS will continue to evaluate compliance with this rule and associated failures to determine the effectiveness of ongoing response actions and whether other response actions are indicated. NS will reinforce the proper procedures again in the next system-wide rules classes.

6.1.2 H307/H306 - Shoving Movement - Man at Lead End, Failure to Control (H307) or Man Absent from Lead Eng (H306)

This failure mode involves shoving movements that are not properly controlled when a man is at the lead end of the movement or when a man is not at the lead end of the movement. This failure mode has a high frequency of occurrence and a potentially high impact, but has not been the cause of any hazardous materials releases on NS or the Northern Region from 1994 through 1998. Comparative analysis, shown in Figure 6.1.3, found that H307 occurred substantially more frequently on the Eastern and Western Regions than on the Northern Region and that H306, shown in Figure 6.1.4, seems to be occurring more frequently on the Northern Region over the past two years.

Cause: This failure mode is caused by failure to comply with NS Operating Rule 508 or NORAC Rule 711 (for H307) or NS Operating Rule 103 or NORAC Rules 101 and 116 (for H306).

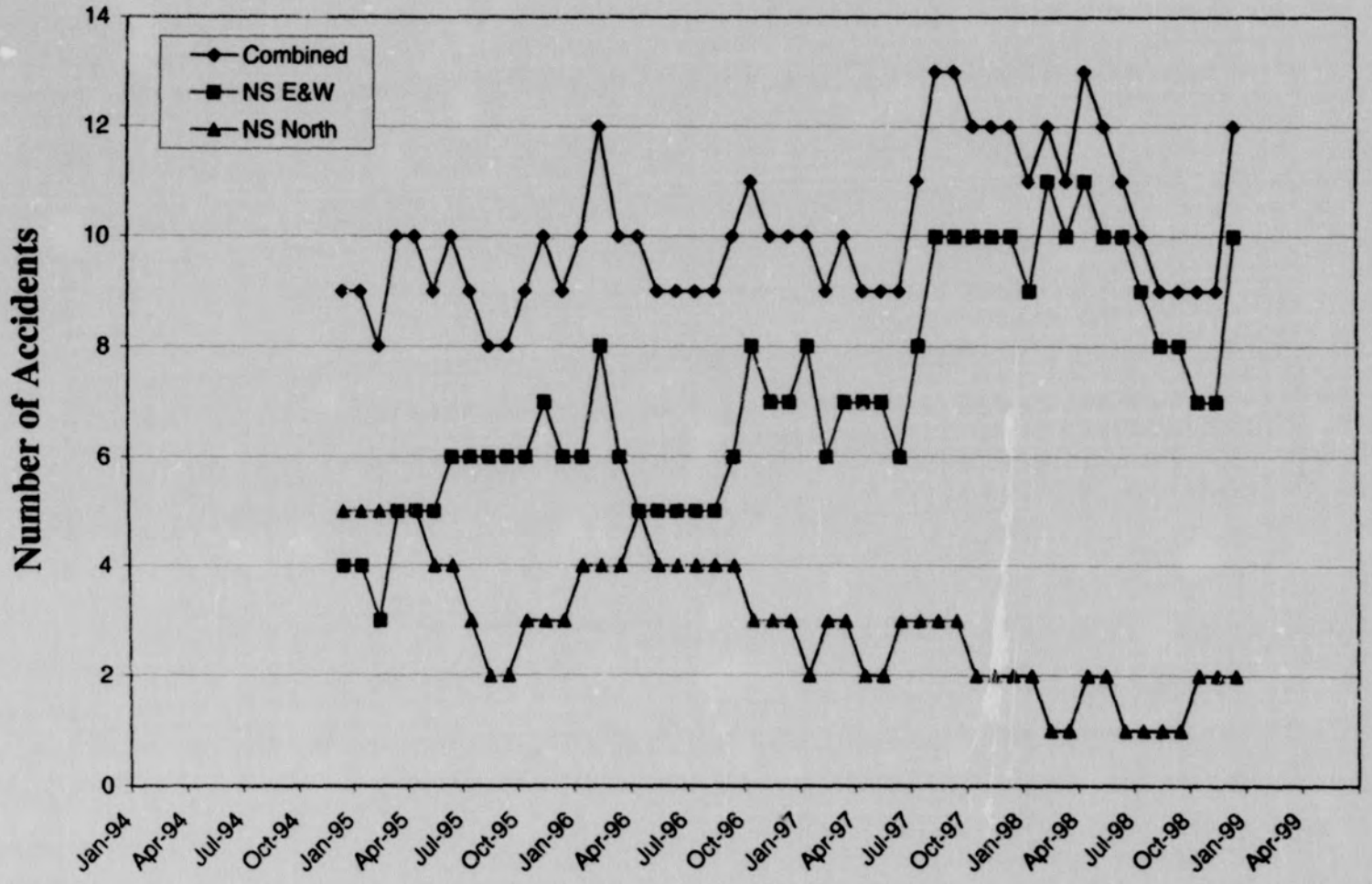
Yard Accidents - 12 Month Sliding Value*
H702 - Switch improperly aligned



* = Each point on the figure represents the sum of accidents over the past 12 months. This smooths out random variations allowing trends to be more readily observed.

Figure 6.1.1

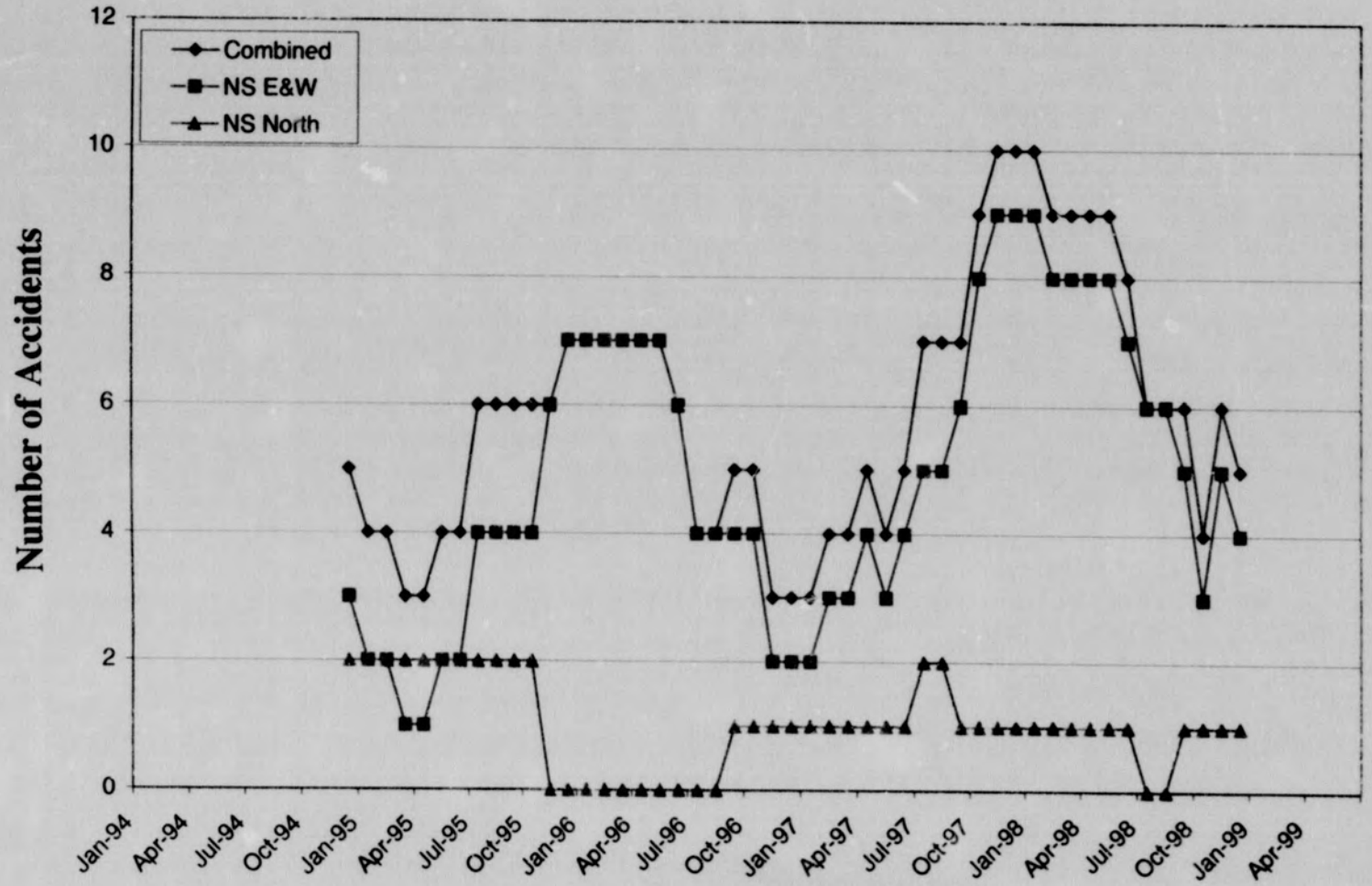
Yard Accidents - 12 Month Sliding Value*
H704 - Switch previously run through



* = Each point on the figure represents the sum of accidents over the past 12 months. Tbis smooths out random variations allowing trends to be more readily observed.

Figure 6.1.2

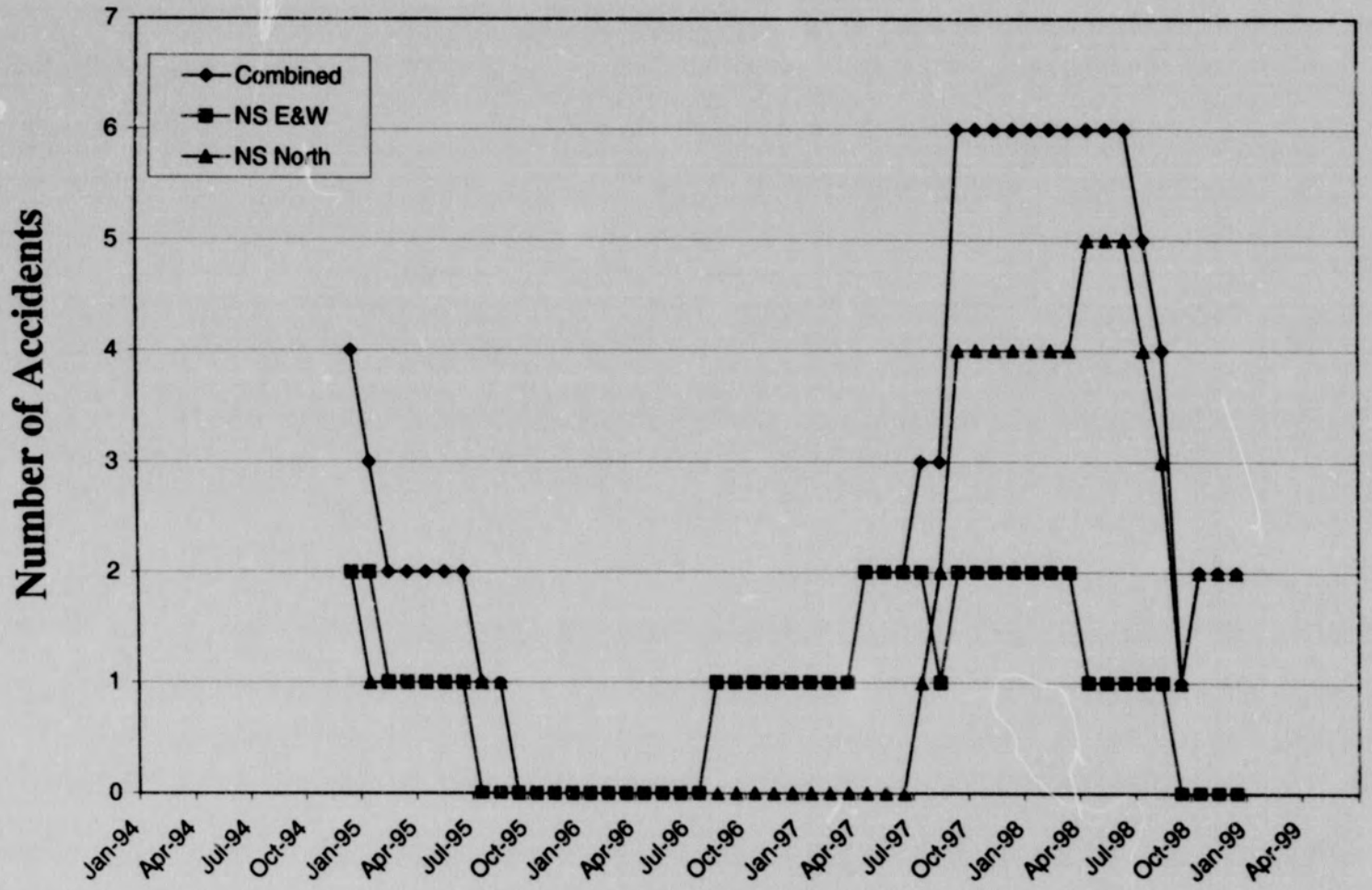
Yard Accidents - 12 Month Sliding Value*
H307 - Shoving movement, man on or at leading end



* = Each point on the figure represents the sum of accidents over the past 12 months. This smooths out random variations allowing trends to be more readily observed.

Figure 6.1.3

Yard Accidents - 12 Month Sliding Value*
H306 - Man Absent from Lead End



* = Each point on the figure represents the sum of accidents over the past 12 months. This smooths out random variations allowing trends to be more readily observed.

Figure 6.1.4

Response Action: Norfolk Southern's Operating Rules group has identified and treated this issue as a priority in recent years. Annual rules classes and exams on NS have addressed these rules and the need to stop movement unless it is confirmed by communication from a man at the lead end of the move, or in certain instances by direct sight, that continued movement is safe and unobstructed. These issues have been included in NS' annual Transportation Department rules classes and exams since 1997.

NS is reviewing the rules and practices on the Eastern and Western Regions compared to current Northern Region practices to determine if a difference in practices explains the difference in failures and to determine appropriate corrective action. NS will reinforce proper procedures system wide in the next annual rules classes. NS will continue to evaluate compliance with these rules and associated failures to determine the effectiveness of ongoing response actions and whether other response actions are indicated.

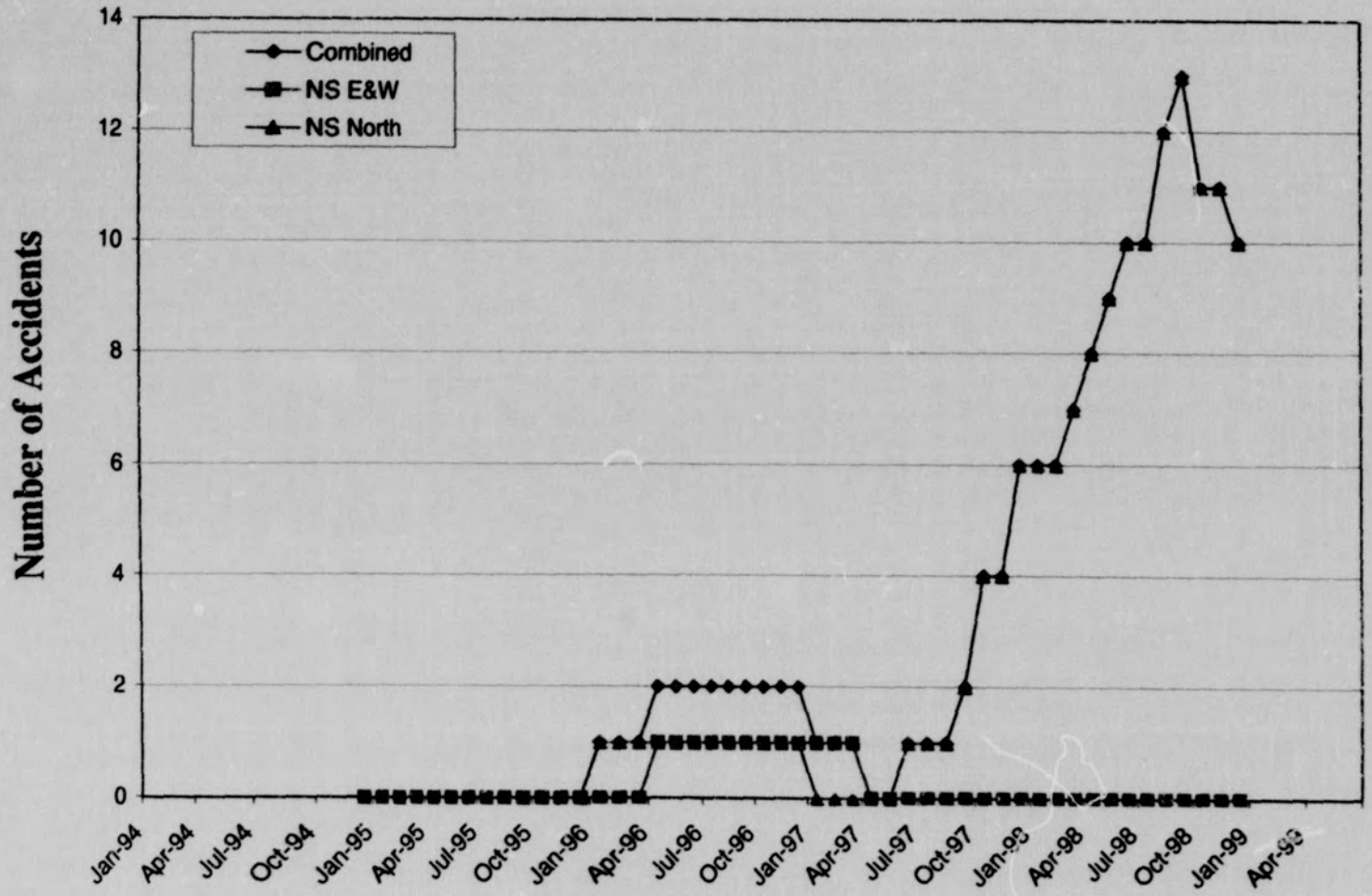
6.1.3 H312 - Passed Couplers

This failure mode involves accidents resulting when couplers are not properly aligned and pass rather than coupling together. There were 17 instances of this failure mode on what is now the Northern Region versus 1 instance on the Eastern and Western Regions over the five years of study. The frequency of this failure mode has increased substantially on the Northern Region since October, 1997. Figure 6.1.5 shows the trend. There has not been an actual release of hazardous materials stemming from this failure mode in the past five years. However, there is insufficient data on the severity of this failure mode for the Northern Region to exclude the possibility that a priority response is warranted.

Cause: The cause of passed couplers is failure to comply with NORAC Rule 101 or NS Operating Rule 103(i).

Response Action: Norfolk Southern's Operating Rules group is comparing rules and practices on the Eastern and Western Regions to the Northern Region to determine if a difference in practices explains the difference in frequency of failures and to determine appropriate corrective action. After the reason for the difference in performance is identified and/or the cause is confirmed, NS will determine and implement the response action.

Yard Accidents - 12 Month Sliding Value*
H312 - Passed couplers



* = Each point on the figure represents the sum of accidents over the past 12 months. This smooths out random variations allowing trends to be more readily observed.

Figure 6.1.5

6.1.4 H020 - Failure of Railroad Employee(s) to Apply Sufficient Number of Hand Brakes on Rail Car(s)

This failure mode has a high frequency of occurrence and of severe incidents. All 14 incidents during the five years studied occurred on the Eastern and Western Regions. Norfolk Southern's analysis included one accident in this analysis that occurred on mainline track but was directly attributable to a failure originating in a yard. The resulting derailment, discussed below, caused a severe hazardous materials release.

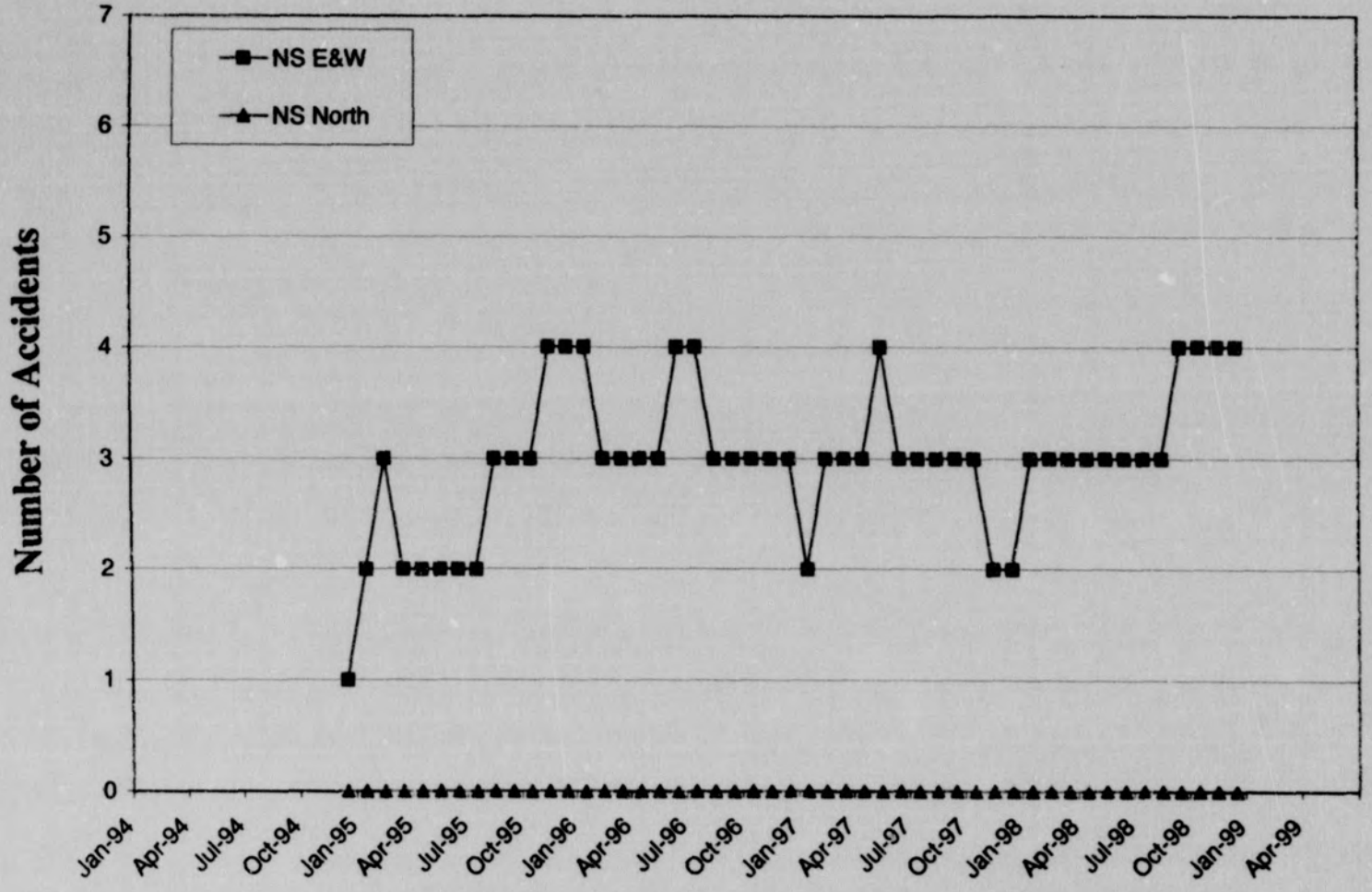
Cause: The failure mode is caused by failure to comply with NS Operating Rule 102(b) or 103(d) and/or failure to comply with NS Division Timetable special instructions or NORAC Rule 109 and Timetable special instruction 109-3.

Response Actions: NS Operations Division and Operating Rules group have previously identified and treated this cause as a priority. Annual rules classes and exams on NS have addressed these rules. Figure 6.1.6 shows that the frequency of occurrence has increased since 1994, but remained essentially constant for the past four years in spite of the previous response actions.

To increase awareness and make needed compliance information readily available to employees, NS includes the specific requirements of these rules and any additional site-specific special instructions in each Division Timetable.

On March 31, 1998, NS experienced a severe failure of this mode in Lynchburg, Virginia involving a runaway cut of cars that collided with a standing, unoccupied train resulting in a large hazardous materials release, a fire, an evacuation, destruction of two locomotives, severe damage to a third and destruction of several cars. Fortunately, there were no injuries. While conducting the emergency response, NS simultaneously moved quickly to identify the cause of the accident and the need for corrective action. NS used this accident as an opportunity and training tool to increase employee awareness of the effects of failure to comply with these rules and instructions. Within three days of the incident, NS had prepared a script and was filming an awareness/training video on-scene. The 30 minute video reviewed the rules, the specific sequence and confluence of events that led to this accident and showed the magnitude of damage and the clear potential for injuries and/or fatalities. This video was incorporated in the annual Transportation Department rules classes and was used by other departments for safety and rules training.

Yard Accidents - 12 Month Sliding Value*
H020 - Failure to Apply Hand Brakes



* = Each point on the figure represents the sum of accidents over the past 12 months. This smooths out random variations allowing trends to be more readily observed.

Figure 6.1.6

Norfolk Southern's Operating Rules group is reviewing the rules and practices on the Eastern and Western Regions compared to the Northern Region to determine if a difference in practices explains the difference in failures and to determine appropriate corrective action.

NS will reinforce the rules and proper procedures in the next rules classes. NS will continue to evaluate compliance with this rule and associated failures to determine the effectiveness of ongoing response actions and whether other response actions are indicated.

6.1.5 H503 - Buffing or Slack Action Excessive

There were 12 instances of this failure mode on what is now the Northern Region and no instances on the Eastern and Western Regions over the five years of study. Figure 6.1.7 shows the frequencies for the two regions. There has not been an actual release of hazardous materials stemming from this failure mode. However, there is insufficient data on the Northern Region on severity to exclude the possibility of high priority.

Cause: These failures are from improper train handling, resulting in excessive buff/slack action. The cause is failure to comply with EC99 Instructions 18.1.7, 18.2.6, 18.5.6 or 18.5.7, or NS-1 Rules for Equipment Operation and Handling L-242, L-243 or L-244.

Response Action: Norfolk Southern's Operating Rules group is reviewing the rules and practices on the Eastern and Western Regions compared to the Northern Region to determine if a difference in practices is the cause of the difference in frequency of failures and to determine any appropriate corrective action.

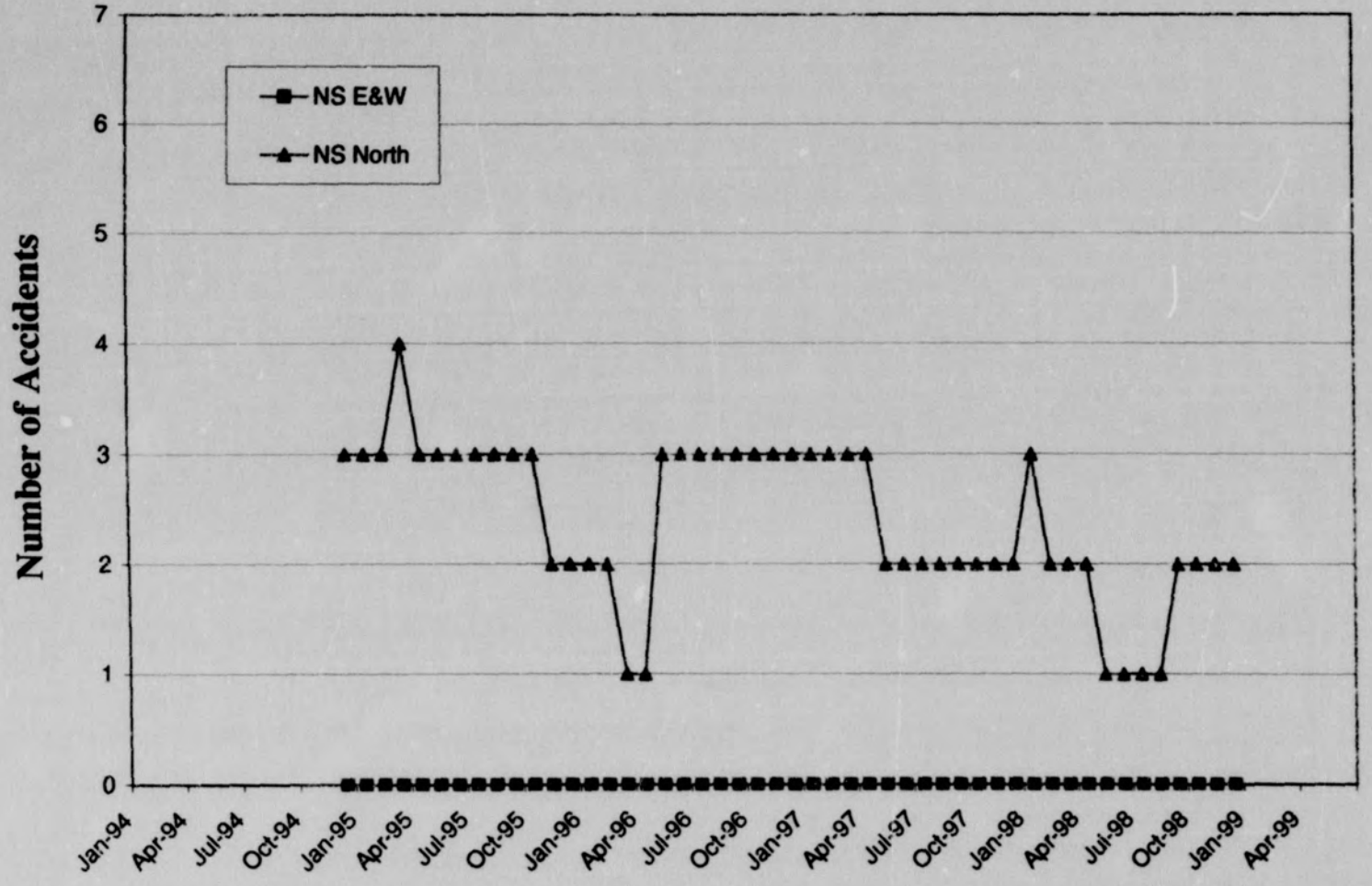
6.1.6 H605 - Failure to Comply with Restricted Speed

This cause has a moderate frequency of occurrence and of severe incidents, but has not been the cause of any actual hazardous materials releases in the five years studied. Trend analysis of the data indicates that FRA-reportable incidents of this type showed an increase beginning in 1997 (Figure 6.1.8).

Cause: This failure mode is caused by failure to comply with NS Operating Rule 105 or NORAC Rule 98.

Response Action: Norfolk Southern's Operating Rules group has identified and treated this issue as a priority in recent years. The annual Transportation Department rules classes and

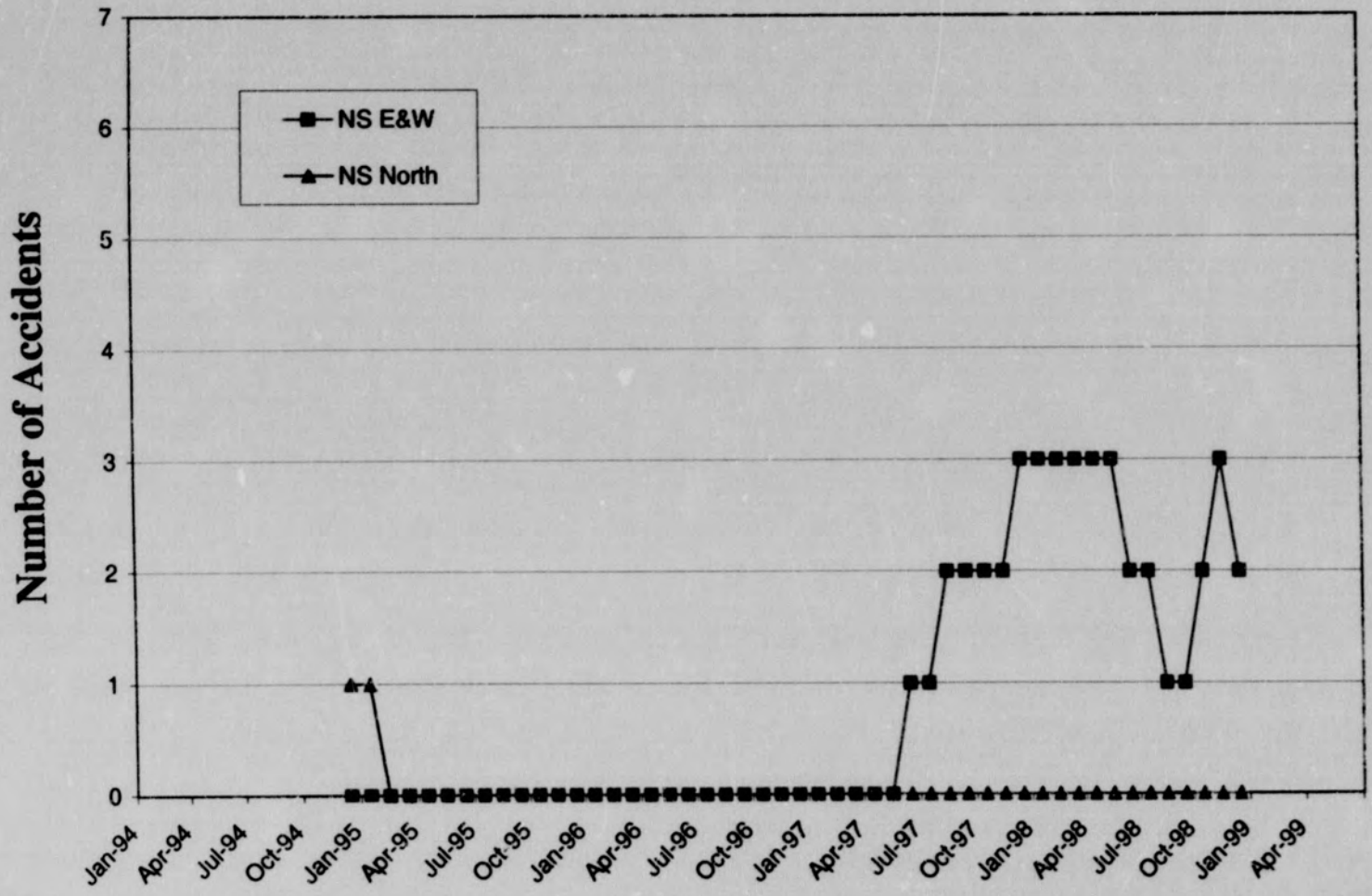
Yard Accidents - 12 Month Sliding Value*
H503 - Buffing or Slacking Action Excessive



* = Each point on the figure represents the sum of accidents over the past 12 months. This smooths out random variations allowing trends to be more readily observed.

Figure 6.1.7

Yard Accidents - 12 Month Sliding Value*
H605 - Failure to Comply with Restricted Speed



* = Each point on the figure represents the sum of accidents over the past 12 months. This smooths out random variations allowing trends to be more readily observed.

Figure 6.1.8

exams on NS have addressed these rules and the reasons and importance for complying with speed restrictions since 1997.

NS will reinforce the rules and proper procedures in the next rules classes. NS will continue to evaluate compliance with these rules and associated failures to determine the effectiveness of ongoing response actions and whether other response actions are indicated.

6.1.7 H525 - Train Handling Involving the Improper Use of an Independent Engine Brake

This failure mode has a moderate frequency of occurrence and high frequency of severe incidents, but has not been the cause of any actual hazardous materials releases.

Cause: This failure mode is caused by failure to comply with NS-1 Rules for Equipment Operation and Handling L-243 or EC99 Instruction 18.1.7.

Response Action: Norfolk Southern's Operating Rules group has identified and treated this issue as a priority in recent years. An analysis of the time frame of previous events (Figure 6.1.9) indicates that the last FRA-reportable incident occurred in 1997. It appears the response actions have been effective in correcting the cause of this failure mode.

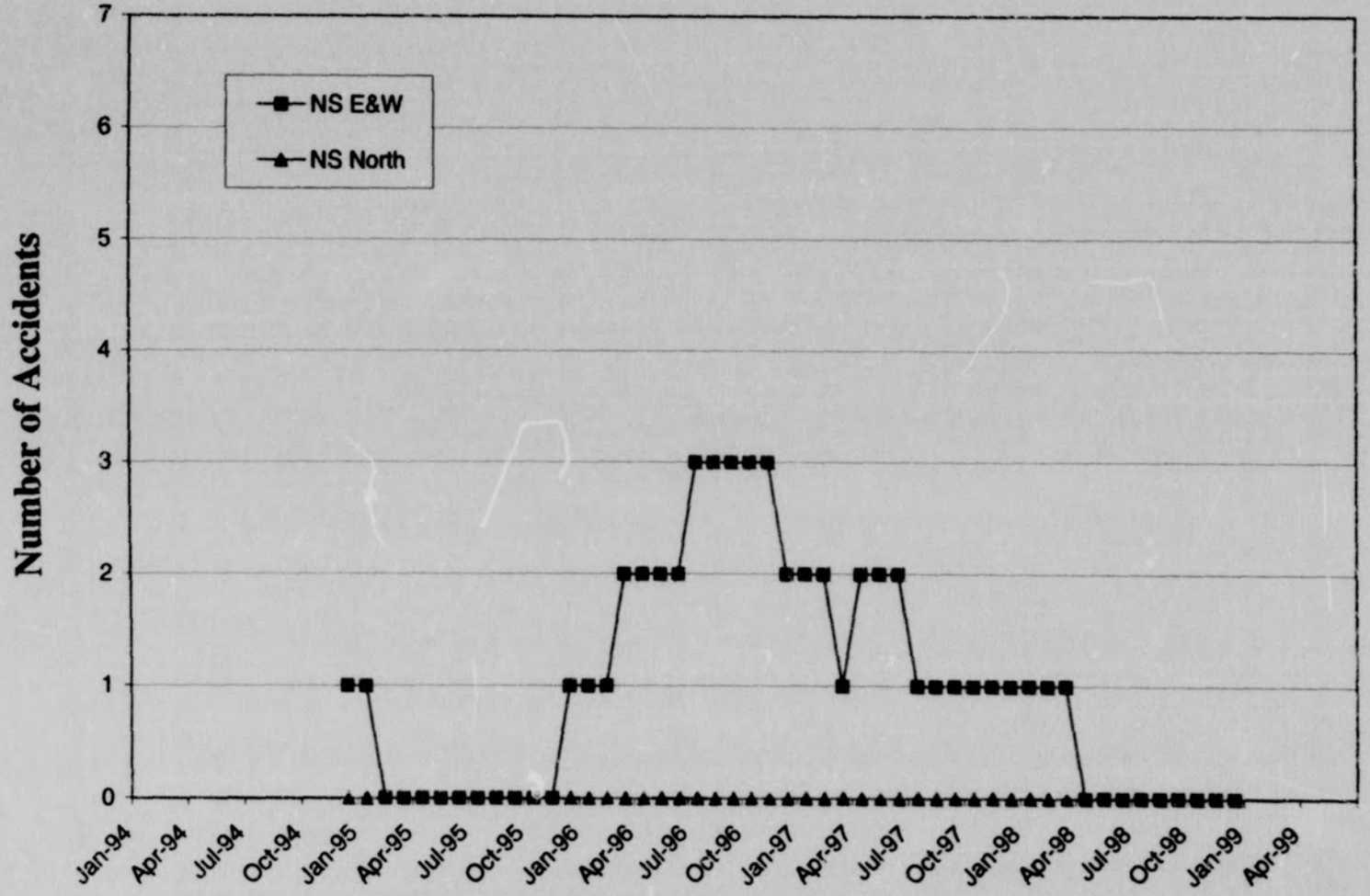
6.1.8 T202 - Broken Base of Rail

This failure mode is in the FRA category of Track, Roadbed, & Structures. The failure mode is infrequent for yard accidents (four incidents total in five years) but a failure in 1996 resulted in a severe release of hazardous materials. The trend is shown in Figure 6.1.10.

Cause: The cause of this failure mode is broken rail due to a rail defect.

Response Actions: Norfolk Southern schedules inspections of rail in yards for internal defects (ultrasonic testing) every one or two years, depending on the activity level of the yard. Visual inspections of turnouts are conducted monthly. In hump yards, visual inspections of the rails at the hump and through the main and group retarders are performed every two weeks. In addition to the above described rail inspections, track inspections are performed which meet or exceed requirements stated at §213.233 in the FRA's Track Safety Standards.

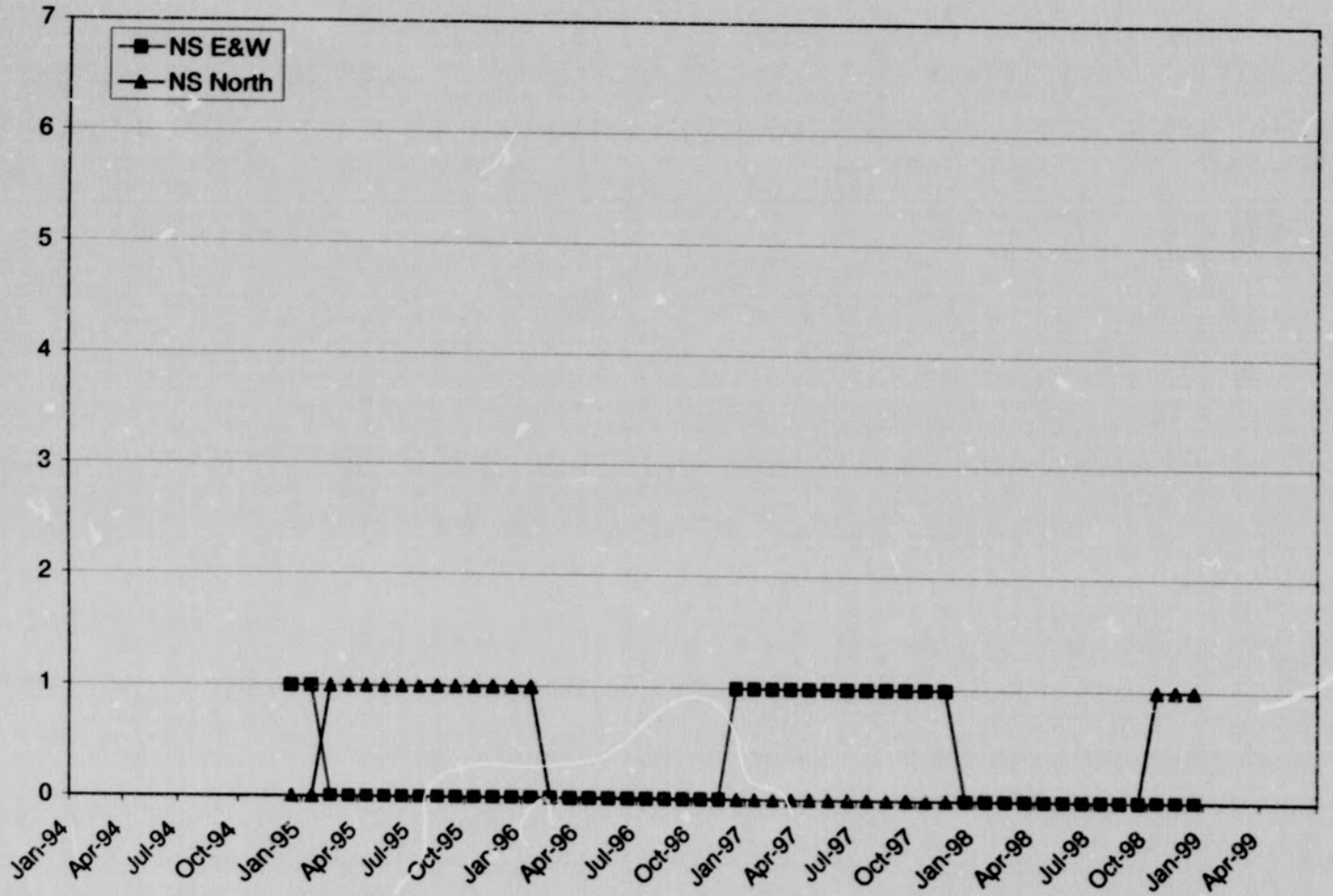
Yard Accidents - 12 Month Sliding Value*
H525 - Improper Use of Independent Engine Brake



* = Each point on the figure represents the sum of accidents over the past 12 months. This smooths out random variations allowing trends to be more readily observed.

Figure 6.1.9

Yard Accidents - 12 Month Sliding Value*
T202 - Broken Base of Rail



* = Each point on the figure represents the sum of accidents over the past 12 months. This smooths out random variations allowing trends to be more readily observed.

Figure 6.1.10

For decades, Norfolk Southern's Research & Test Laboratory and Engineering Department have actively sought and implemented improvements in non-destructive test procedures to identify defects in rail before failure and to reduce the rate and severity of defects in rail purchased by Norfolk Southern. Through active participation in industry and inter-industry groups, these practices have had beneficial impacts for the rail industry and suppliers. These efforts have proven very effective at reducing the rate of broken rail failures on NS and in the rail industry and will continue.

NS will continue to monitor the rate of this failure mode to determine if there is a need for action beyond the ongoing efforts to decrease rail defects and failures.

6.2 Non Accident Releases - Cause and Response

As discussed earlier, most releases of hazardous materials in railroad transportation are not the result of train accidents or derailments. Rather, they are most frequently from tank cars that develop leaks for various reasons while in transportation. The majority of these leaks are due to improperly secured loading or unloading fittings on tank cars, or the various seals and gaskets that are intended to prevent leakage around these fittings and are generally unrelated to railroad handling. In general, the former are a result of inadequately trained or supervised personnel, and the latter a result of inadequate maintenance by the tank car owner or operator.

NS does not build, maintain, or lease tank cars and does not control the equipment or practices resulting in non-accident releases. Although railroad personnel can and do reject tank cars offered for shipment that are leaking, frequently these problems do not manifest themselves until after the car is already underway. When such a failure occurs, NS takes the appropriate action to address the problem enroute. While NS does not have control over the sources of NARs, NS is committed to facilitating improvements to reduce the frequency and severity of failures through participation in rail industry committees and programs, and inter-industry efforts described in Section 2.3, and assuring that shippers are aware of failures and encouraging them to undertake preventive measures.

There is a wide variety of potential failure modes for non-accident releases. However, a review of industry-wide data and NS's analyses in this FMEA indicate that a small number of causes are at the root of most non-accident release failures. The key to preventing these releases is to improve the tank car securement and maintenance practices used by hazardous materials shippers and tank car operators. While NS and the railroad industry do not usually control the

failure causes, focusing attention on correcting these problems can have a large effect on reducing the incidence of hazardous materials releases.

Response Actions for All Non-Accident Releases (NARs): The following NS response actions apply in general to all NARs.

- When NARs occur, whenever safe and practical, the NS Hazardous Materials group contacts the shipper and asks them to take direct responsibility for the response and repair. (This normally involves slow releases where the car has been isolated and the leak has been controlled or leakage is being captured.) This provides shippers with detailed knowledge of the incident and the incentive to take actions to prevent reoccurrences.

- For every NAR, Norfolk Southern's Hazardous Materials group provides a copy of the DOT Form F5800.1 for hazardous materials releases to the shipper.

- When NS detects a pattern of failures from a particular shipper or site, the NS Hazardous Materials group contacts the shipper to ensure they are aware of the problem and potential corrective actions and to strongly encourage corrective action including review of:
  - sound loading and unloading procedures.
  - the benefits of post-load pressure testing of tank cars.
  - sound practices for scheduled inspection and replacement of parts subject to failure such as O-rings, gaskets, frangible discs, etc. and developing a program for preventive maintenance as prescribed in the AAR Tank Car Manual M-1002 Appendix U.
  - other items as indicated by the nature of the failures.

- NS participates in the North American Non-Accident Release (NAR) Program including:
  - NS provides copies of all DOT 5800 reports to AAR.
  - AAR provides an action package to those shippers that exceed a threshold rate of NARs, industry-wide.

- NS and other railroads, through AAR and in cooperation with other transportation modes, shippers, container manufacturers, and labor, has asked the Research and Special Programs Administration (RSPA) to collect certain more specific information by revising the Form DOT F5800.1. This would provide better data collection on incidents to identify priority problems, support better regulations, target enforcement actions, and reduce exposure to

carrier personnel. In response, RSPA has recently issued an Advanced Notice of Preliminary Rule-Making (Docket HM229) requesting input for revising the form.

The discussion that follows addresses the causes and response actions of each of the priority NAR failure modes identified in this FMEA. The response actions above apply to every individual NAR incident and/or to every NAR failure mode. Where NS is undertaking response actions specific to a particular failure mode, they are presented below.

6.2.1 Safety Vent (Defect Code N)

Cause: The primary cause of safety vent failures is burst frangible discs.

Most NARs from tank cars transporting corrosive materials are due to a single cause unique to this group of cars, burst frangible discs in tank car safety vents. Since about 24 percent of Norfolk Southern's hazardous materials traffic comprises Class 8 corrosive materials transported in non-pressure tank cars, it is not surprising that NS experiences these types of incidents. The safety vent is a device that is intended to provide pressure relief, primarily in the event of a thermally induced over-pressure situation in an accident in which a car is engulfed in fire. Safety vents differ from safety valves in that they employ a frangible disc with a specified burst pressure rating instead of a reclosable valve. Frangible discs burst when they are exposed to their rated burst pressure and then must be replaced. Frangible discs are designed to reduce the severity of an incident by relieving pressure with a smaller, slower release before a catastrophic tank failure occurs.

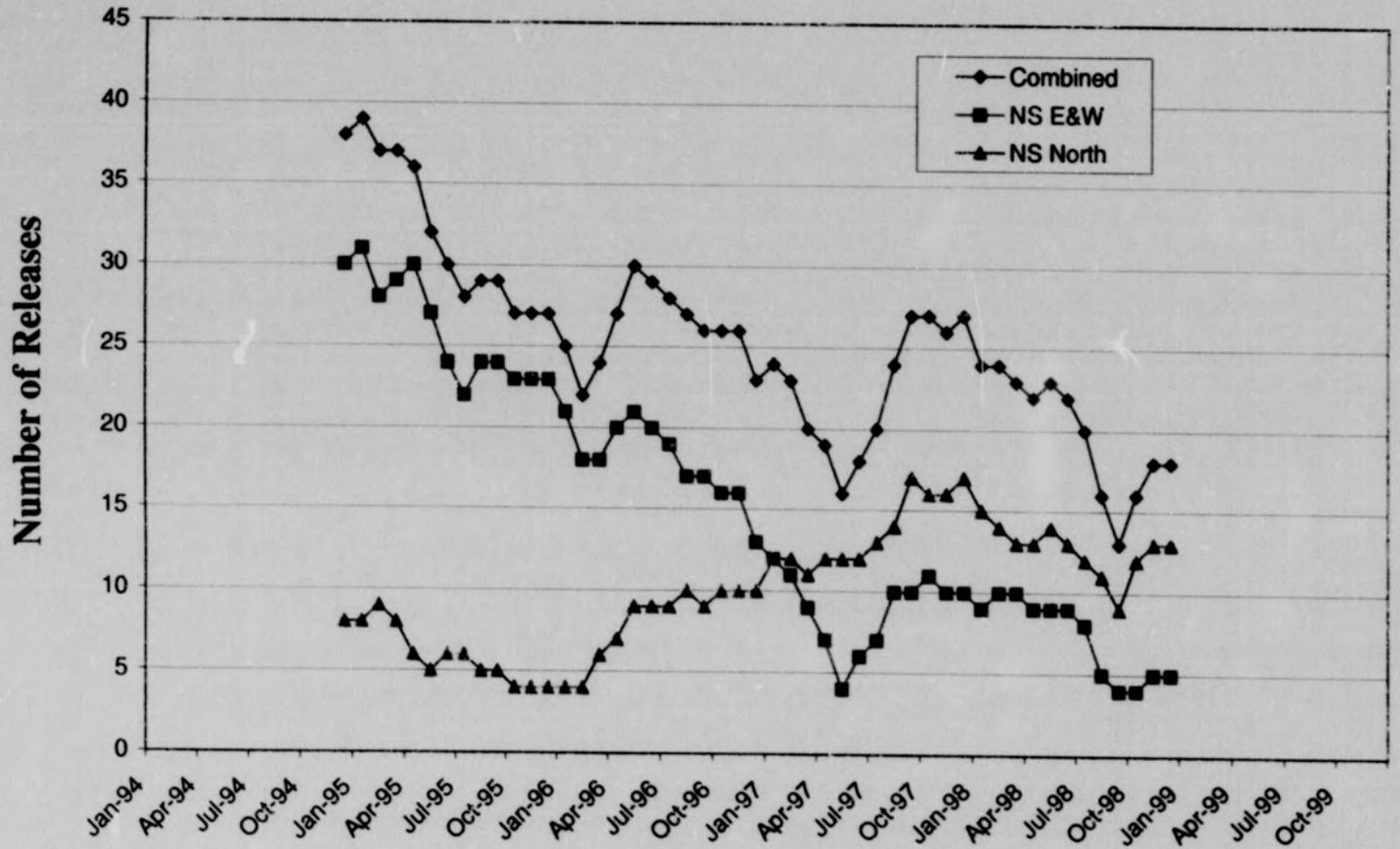
If burst frangible discs occurred only in the accident circumstance described above, the releases would be preferable to the potential more serious failure and the burst disc would not pose a NAR problem. However, they fail much more frequently as a result of momentary surges in pressure that occur due to liquid sloshing within the tank car during transportation. This sloshing creates a "liquid hammer" in the nozzle on which the safety vent is mounted. If the resultant momentary surge in pressure in the nozzle exceeds the rated pressure of the disc, it will break. After the disc breaks, it remains in place until the break is detected and the disc is replaced. The safety vent is located on top of the tank car so the broken disc may remain undetected for many miles of travel. In the interim, the safety vent remains open to the atmosphere allowing fumes to escape and liquid to spill out whenever the car is sufficiently accelerated or decelerated.

Over the past several years, the frangible disc has been the single most frequent cause of NARs, however in the past few years, this number of incidents has begun to decline. There are two probable reasons for this. Based on AAR research, the Tank Car Committee, on which NS is a participant, mandated the use of safety vent surge pressure reduction devices (SPRD) on all new tank cars equipped with safety vents. These devices work by reducing the rate of liquid surge that causes the high pressure event that bursts the disc. In a cooperative research project by AAR, Chlorine Institute, FRA, and RPI it was shown that the effectiveness of the different SPRDs varies widely. Some are much more effective in reducing the pressure in the safety vent nozzle than others. NS will encourage shippers and tank car owners to install the most effective of these SPRDs on tank cars that use safety vents. Secondly, in 1998, US DOT raised the required burst pressure rating for frangible discs from 25 percent to 33 percent of the tank burst pressure. This means that the disc requires a higher pressure surge before it will burst. This change was promulgated only after the FRA evaluated information from railroads and suppliers indicating that burst pressure ratings could be increased without increasing tank shell failures.

The measures described above are intended to make tank cars with frangible discs more able to withstand the forces normally experienced in transportation. However, the problem can be exacerbated by shippers over-filling tank cars and over-speed impacts by railroads, so measures to prevent these two failure causes will further help reduce the incidence of this type of NAR. NS is addressing over-speed impacts by complying with the industry recommended rail coupling speeds as outlined in AAR Circular OT-55. The AAR Circular states that maximum reasonable effects will be made to achieve coupling of loaded placarded tank cars not to exceed 4 mph.

Response Action: NS has supported industry efforts resulting in AAR mandating the use of safety vent purge pressure reduction devices (SPRDs) and FRA raising the required burst pressure rating of frangible discs. To raise awareness and encourage use of the most effective SPRDs, NS provides the shipper a copy of the AAR report *Effectiveness of Tank Car Safety Vent Surge Reduction Devices* with the DOT Form F5800.1. Figure 6.2.1 suggests these efforts, described in more detail below, are reducing the failure rate of frangible discs and associated hazardous materials releases. NS will continue to encourage shippers to use the most effective SPRDs. In addition, NS operates a "Go for Four" program to implement the AAR guidance and reduce overspeed couplings.

Hazardous Material Releases - Non Accident - Tank Car
12 Month Sliding Value* - Defect Code N - Safety Vent/Frangible Disk



* = Each point on the figure represents the sum of the releases over the past 12 months. This smooths out random variations allowing trends to be more readily observed.

Figure 6.2.1

6.2.2 Tank Car Manways - Gasket Failures and Bolts (Defect Codes F&L)

Causes: Improper maintenance/replacement intervals of gaskets; gasket/product incompatibility; improper torque patterns or pressures resulting in cut gaskets or stretched bolts; manway design issues.

The other major cause of leaks from tank cars carrying corrosive materials and many other non-pressure commodities, particularly flammable liquids, is from the manway. With the recent decline in the rate of safety vent leaks, manway leaks have emerged as the next leading cause of hazardous materials releases in the rail transportation industry. The manway is a hatch, typically 20-inches in diameter, on the top of the tank car whose principal intended purpose is to provide access to the inside of the tank car for maintenance personnel. The need for this sort of interior access is relatively infrequent. However, many chemical loading facilities also use the manway as a fill port to load product. In transit, the manway is sealed by the manway cover, a large circular plate that is bolted in place on top of the manway, typically using six or eight bolts to secure it. A large gasket is used to ensure that there is a tight seal between the manway cover and the manway. Unfortunately there are several aspects of the process and design that make manways particularly prone to leakage.

To fulfill its intended purpose of providing access into and out of the tank car, the manway must be large enough to allow a person through. This makes the manway cover awkward to handle and difficult to properly align the gasket prior to securement (occasionally, the gasket will even fall inside the car). However, the lack of an easy-to-use, easy-to-secure fill port on many tank cars means that opening and then closing and properly sealing the manway must occur prior to every shipment.

In addition to the frequent need to open and close them, manways suffer from design problems that compound the difficulty of securing them. The nuts that fasten down the manway cover are often difficult to properly access. This makes it difficult to get a wrench on the nuts, and frequently causes the wrench to slip when force is applied. This in turn tends to round off the edges of the nuts leading to the use of a pipe wrench, further damaging the nuts. If too much pressure is applied, the bolt will stretch and no longer provide a seal. Loading personnel also sometimes fail to use the proper tightening sequence thereby aggravating the problem by warping the cover, getting an improper gasket seat or cutting the gasket. The frequent need to perform this task as part of the tank car loading operation combined with the difficulty of doing it properly, results in a frequently occurring source of leakage.

Manway gaskets are elastomeric materials which, after being secured between the manway and the manway cover, will relax and require retightening of the bolts. This is often overlooked, and can result in a release. In addition, sometimes a product that is incompatible with the gasket material will be loaded into a tank, or an incompatible gasket will be placed on the tank car, which also can result in a release.

Response Actions: NS is supporting a current study by the AAR Bureau of Explosives into these problems. The study includes discussions with shippers who have experienced frequent manway cover leaks and others who have a very low incidence of these failures to compare practices and determine the most effective practices.

6.2.3 Tank Failures (Defect Code E)

Causes: Tank car interior lining failures occur due to improper maintenance and/or inspection, resulting in corrosion and tank shell failure; or improper welds and modifications to the tank car.

Although tank failures do not frequently occur, they represent the most serious type of NAR defect, because they are often difficult to control. This generally results in much greater loss of lading compared to leaks from valves and fittings; and therefore, the consequences of these incidents are often more significant. Sometimes the tank failure is catastrophic, releasing the entire contents of the tank car at one time. When a tank failure is controlled, emergency response efforts often involve transferring these commodities to another tank car or to tank trucks.

The majority of tank failures can be attributed to lining failures, which allow an incompatible product (often corrosive materials) to have direct contact with the tank, eventually causing the tank to fail. Repairing these leaks can be complicated by the fact that many of these cars may be jacketed, which makes it difficult to identify exactly where the tank car has failed. Preventing these types of incidents depends on the performance of shipper and tank car owner inspection programs.

Other tank car failures are a result of improper modifications or poor workmanship (i.e., cracks in the weld). These incidents are rare and unpredictable.

Response Actions: For any identifiable design or workmanship problem that poses a serious safety threat on a particular group of cars, NS issues a mechanical advisory and/or will

embargo the series of cars, through AAR, for immediate inspection prior to further movement. This minimizes the chance for another catastrophic release from the same defect on other cars in the series.

NS supports and participates in the NAR Program and the AAR Tank Car Committee which reviews tank car design, specification, maintenance and failure issues. After July 1, 1998, no tank car facility may manufacture, repair, inspect, test, qualify or maintain tank cares unless they have a quality assurance program, approved by the AAR in accordance with 49 CFR 179.7. Many of the QA audits are performed by AAR Bureau of Explosive field inspectors.

6.2.4 Bottom Outlets & Fittings (Defect Codes G&R)

Cause: Bottom outlets, gaskets, valves, and other fittings fail due to inadequate securement, inadequate maintenance, or poor design.

Both Flammable and Combustible Liquids are commonly unloaded from the tank car using the bottom outlet. This is convenient for the consignees because it requires a less expensive unloading facility. However, it necessitates fittings located on the underside of the tank car. While the use of gravity simplifies the unloading process, it also creates a situation in which any deficiency in the securement of the caps, plugs and valves on the bottom of the car can result in a leak. Also, because these fittings are on the bottom of the car, a car that has been unloaded has as high (and possibly a higher) chance of suffering leakage from the bottom outlet. This is because a substantial amount of residue product remains within these "empty" cars. Therefore, in order to prevent this type of leak from occurring, the fittings must be properly secured by the shipper prior to shipment of a load, and by the consignee prior to shipment of the "empty" return. This effectively doubles the opportunity for a problem compared to top fittings, since both loaded and empty trips are at risk for a leak. Compounding the problem is that many consignees are smaller businesses that do not have as much technical sophistication regarding hazardous materials shipping requirements and regulations as do the large petroleum and chemical companies. Yet these small companies have the principal responsibility to properly secure the bottom fittings prior to the residue return trip. The shippers do not necessarily need to open these valves to load the car although they generally have responsibility for maintenance. Although it is the shippers' responsibility to ensure that the fittings are properly secured prior to shipment of the loaded car, they may rely on the consignee to have satisfactorily performed this task.

Some shippers prefer that bottom outlets not be used because they create an additional maintenance item and create the above described opportunity for NARs. Solid contaminants or

residues have a tendency to collect at the bottom and can clog the valve so that it cannot be fully closed. However, since many of their customers desire the option of gravity unloading from the bottom outlet, shippers are obliged to use them on the tank cars.

As with the manway, there are design issues that make the securement process difficult. Securement of the bottom outlet requires the following steps be properly completed: the gaskets should be checked and replaced as necessary prior to securement; the gasket seats on the valve and cap must be inspected for defects; the valve must be securely shut; and the protective cap that provides secondary securement must also be tightly sealed (sometimes various parts of the tank car running gear such as brake rods can interfere with the use of a wrench large enough to develop adequate torque to securely close the cap and there are no specified torquing requirements for the cap).

General service tank cars may be equipped with a top operated internal plug valve for their bottom outlet. In such a case, the "stuffing box" contains a packing gland for the internal plug valve operating rod. The packing gland must be tight enough to insure the operating rod will not wiggle during transportation and open the internal plug valve for the bottom outlet. If the packing gland is not secured, a vapor leak may result. In addition, should the packing inside the stuffing box not be properly maintained, the packing gland may not secure the rod nor make it vapor tight.

Certain bottom outlet valve types are "suspected" to have design problems resulting in a high failure frequency. However, FRA does not currently have sufficient data to adequately document this problem and better information is needed.

Response Actions: NS applies the general response actions listed above to these failures. In addition, the NAR Program group has referred the defective valve issue to the AAR Tank Car Committee. As mentioned above in the listing of general NAR response actions, NS and the rail industry are supporting revision of the DOT Form F5800.1 which would provide the information FRA requires to justify action.

6.2.5 Liquid Eduction Line Valve and Plug (Defect Codes A&W)

Cause: Insufficient inspections; inadequate securement or maintenance prior to shipment; damage from excessive force when closing.

The liquid eduction line is a fitting used for unloading from the top of the tank car. As with the other fittings that have been discussed, if it is inadequately maintained or secured it can develop leaks while the car is in transit. As with bottom outlets, there is a secondary closure that is intended to protect against a leak from the valve itself. The eduction valve often requires considerable force to open and close, thereby subjecting the components such as the valve seats and gaskets to excessive wear. Consequently, these items need to be regularly inspected, and worn items replaced or repaired to prevent leakage. Proper securement of the liquid eduction valve requires that the following steps be properly completed: the gaskets should be checked and replaced as necessary prior to securement, the gasket seats on the valve and cap must be inspected for defects, the valve must be securely shut and the protective cap that provides secondary securement must be tightly sealed. Some shippers are switching from ball valves to angle valves in hopes of achieving greater resistance to scoring and subsequent leakage.

Response Actions: NS applies the general response actions listed in Section 6.2 to these failures.

6.2.6 Packing Glands (Defect Code P)

Causes: Improper procedures prior to shipment; improper tightening and/or maintenance practices.

Packing glands are used extensively on slip tube gauging devices on tank cars. Prior to the car being placed in transit the packing gland is supposed to be tightened. It must be loosened to operate the gauging device during loading operations. Improper procedures or maintenance can lead to leakage from the packing gland during transportation. Often they leak because they are not properly resecured before transit. Another reason is that the repeated tightening and loosing of the packing gland compresses the packing material to a point where it can no longer be securely tightened. Adherence to proper securement procedures and regular inspection and replacement of the packing material will prevent this cause of NAR.

Response Actions: NS applies the general response actions listed in Section 6.2 to these failures.

6.2.7 Safety Valves (Defect Code K)

Cause: Insufficient outage (excess lading) in tank car; inadequate securement of mounting flange; inadequate replacement schedule of O-rings; product/O-ring incompatibility.

Federal regulations require safety relief devices such as a safety valves. Sometimes a release is simply due to the valve performing its function to relieve pressure in the tank. This usually does not occur unless the tank car has been overloaded or the shipper has not allowed sufficient outage for temperature changes.

Leakage from the safety valve is more frequently a problem on tank cars transporting pressurized materials than non-pressurized, although it can happen on both. This generally occurs because the car was overloaded prior to shipment. As the product experiences thermal expansion the pressure inside the car reaches the valve set point and the valve opens to relieve the pressure. Safety valves may also leak at their mounting flange. This could be due to missing nuts or bolts, a failed gasket or loose bolts. Valves also experience leaks due to wear or degradation of the O-rings in the valves. Typical practice is to change out O-rings when the valve is inspected. However, O-ring materials do not necessarily survive the 5-year valve test interval. This interval has been lengthened to 10 years in the regulations, thereby increasing the potential problem of O-ring degradation between valve tests unless tank car owners adopt satisfactory maintenance plans as is now required by the AAR.

The problem of O-ring viability can be made worse by product incompatibility. This is particularly a problem with tank cars that switch between ammonia and LPG service seasonally. O-rings made of material that is compatible with one of these products degrades when exposed to the other. The O-rings should be changed when the product is changed, but often they are not, leading to premature O-ring failure.

Response Actions: RSPA specifies outage requirements with instructions identifying the fill capacity for a particular commodity for various loading temperatures. In addition to the response actions listed in Section 6.2, the NS Hazardous Materials group provides the RSPA instructions and information with the Form DOT F5800.1 to shippers for this failure mode.

6.2.8 Intermodal Failures

Cause: Most intermodal releases are caused by improper blocking and bracing in trailers or containers, which allow load shifts to occur resulting in damage to the individual non-bulk packages in the shipment.

Response Actions: To assist shippers in properly preparing hazardous materials shipments, the AAR has prepared an Intermodal Loading Guide for Products in Closed Trailers and Containers, which is intended to be a comprehensive manual for loading commodities in trailers

and containers for shipments by rail. To prevent serious consequence events, Norfolk Southern has imposed restrictions for many classifications of hazardous materials and specific commodities to be transported in intermodal service because of past experience with poor blocking and bracing.

7.0 NS FMEA PROGRAM

This report documents the initiation of Norfolk Southern's FMEA program. The effective date of this program is August 1, 1999. NS's Environmental Protection Department will coordinate and oversee the ongoing FMEA as an environmental management program, making changes and adjustments as needed to improve its efficiency and effectiveness. This section provides an overview of plans for the continuing NS FMEA program.

7.1 Purpose

The purpose of the NS FMEA Program is to reduce the risk associated with potential releases of hazardous materials in NS railyards and intermodal facilities by reducing the probability and/or severity of releases and accidents.

7.2 Analysis and Investigation

The FMEA analyzes data on hazardous materials releases in NS railyard and intermodal facilities and accidents/failure modes that could have resulted in hazardous materials releases in NS railyard and intermodal facilities. The FMEA program is designed to:

- Recognize and evaluate the potential for an incident involving hazardous materials tank cars or containers and the consequences and effects of such incidents.
- Identify actions that could eliminate or reduce the likelihood of the potential incident.
- Document the FMEA process.
- Periodically review and revise the FMEA while incorporating recent incident history.

7.2.1 Yard Accidents

Yard accidents with causes attributable to NS infrequently result in severe damage and/or release of hazardous materials. To ensure the causes of severe accidents and potential causes of hazardous materials releases are analyzed and appropriate correction is taken, NS is undertaking the following analyses and actions.

(1) Prompt review for root cause and corrective action of yard accidents meeting one or more of the following criteria:

- NS severity index greater than or equal to 300
- Total equipment and yard damage over $250,000
- Hazardous materials release exceeding the Reportable Quantity (RQ)

(2) Quarterly trend analysis and review of yard accidents on a system and yard level with results provided to division officers in the operating departments, terminal superintendents and the hazardous materials group for local analysis and corrective actions.

(3) Annual analysis and review on a system and yard basis, with severity ranking, trend analysis and recommendations, with a formal summary of results submitted to NS management: department heads of operating departments, division officers, terminal superintendents, the hazardous materials group and the operating rules group for determination of corrective actions (e.g. amending an operating rule or a maintenance practice to reduce the frequency of a particular failure, or addressing a particular practice in tracking classes). Corrective actions will be implemented by the appropriate department(s).

7.2.2 Non-Accident Releases

The most frequent sources of hazardous materials releases of small or large quantities in yards are in the category of non-accident releases (NARs). Attributable to defects in shipper packaging (cars or containers), loading and securement, the causes are not under the direct control of NS. NS is committed to assuring that shippers have the information and assistance necessary to reduce NARs, and some incentive to undertake corrective action. NS is also committed to working with industry groups and inter-industry groups to reduce the potential for NARs. To this end, NS will:

(1) For incidents attributable to the shipper, whenever safe and practical, the NS Hazardous Materials group will contact the shipper and ask them to take direct responsibility for the response and repair. (This will normally involve slow releases where the car has been isolated and the leak has been controlled or leakage is being captured.)

(2) Report all releases to the shipper, copying them on DOT Form F5800.1. When local failure trends are identified, advise the shipper on the trend and need for corrective action.

(3) For every NAR, Norfolk Southern's Hazardous Materials group will provide the shipper a copy of the NAR Resource Guide (prepared by the North American Non-Accident Release committee) to improve awareness of potential corrective actions and facilitate improvements.

(4) Participate in the rail industry North American Non-Accident Release (NAR) Program including:

- NS will provide copies of all DOT 5800 reports to AAR.
- AAR will contact shippers whenever a set threshold number of releases, industry-wide, is exceeded.

(5) Evaluate NAR's on an ongoing basis, and for serious defects that have or could have resulted in a catastrophic release, identify and implement any immediate need for action (e.g. embargo a particular group of cars for inspection prior to any further movement) to protect against additional occurrences.

(6) Review NARs quarterly with a formal report annually with priority ranking of failure modes with referral of the results to the NAR Program group and referral of shipper-specific issues to the shipper.

(7) For all incidents attributable to the shipper, NS will seek reimbursement from the shipper for the direct costs of response and repair. This provides shippers with immediate and detailed knowledge of the incident and inherent incentives to take preventive action to prevent reoccurrences.

APPENDIX A

NORFOLK SOUTHERN RAIL YARDS IDENTIFIED BY STB IN DECISION 89 AS SUBJECT TO ENVIRONMENTAL CONDITION 6

NORFOLK SOUTHERN RAIL YARDS

NY01 DORAVILLE YARD, DORAVILLE, GEORGIA

The Doraville Yard is a rail yard located in Doraville, DeKalb County, Georgia, north of I-285. The facility is located ¼ mile north of Longmire Road and Winterchapel Road with access off Winterchapel Road. The Doraville Yard is located just north of Atlanta and operates as a flat switching yard. Cuts from Inman Yard are delivered and classified at the Doraville Yard. All local jobs with the exception of the Doraville Auto Assembly Plant, are set up, built, and classified at this yard.

The rail yard comprises 19 lines of railroad track. The facility is located in an urban/industrial area. The closest US Census tract indicates approximately 2,677 people reside in the area. The peak number of workers on duty at the facility ranges from 6 to 9 workers.

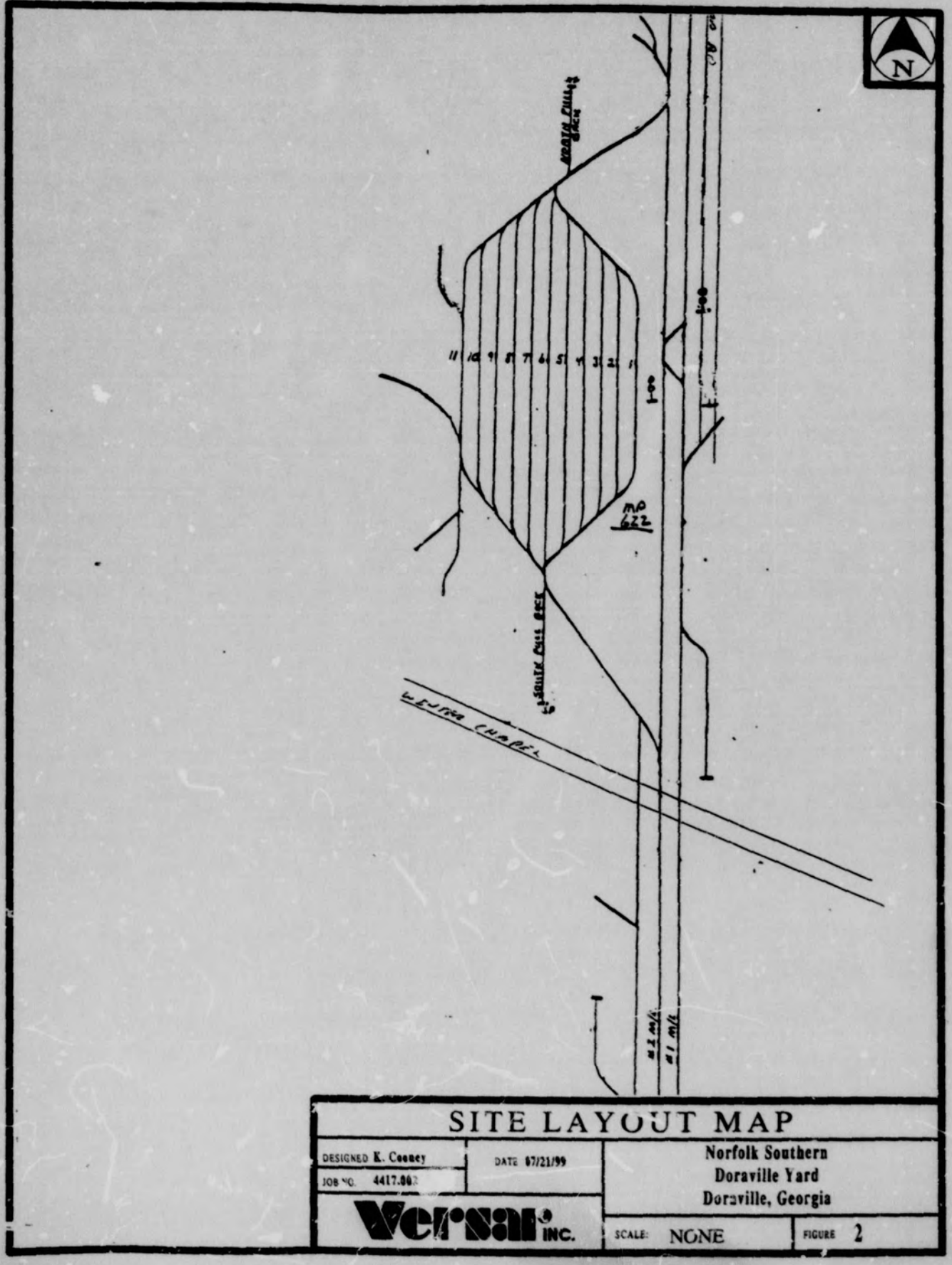
Topography of the Doraville facility is characterized by flat land. The United States Geological Survey (USGS) 7.5-minute Series map of the Chamblee, Quadrangle shows that the elevation of the property is approximately 1,069 feet above mean sea level. There are no surface waters on the site. The closest surface water to the facility is an unnamed creek approximately 3,000 feet to the north. Surrounding sites also appeared to be characterized by flat land, with elevations of approximately 1,069 feet above msl in all directions.

The Doraville Yard is located on Rail Line Segment N-324 from the Hayne Yard, SC to Howell, GA. The final EIS (FEIS) reports the rail cars handled per day at the rail yard is increasing from 174 to 222 cars per day.

On NS, Doraville Yard is included as part of line-of-road operations. Car accounting does not track monthly car classifications at this facility. Line segment N-324 is currently a Key Route. As a result of the acquisition of Conrail, the FEIS concluded that the N-324 rail line segment is not expected to experience a significant increase in hazardous materials transportation.

SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Doraville Yard DeKalb, Georgia
JOB NO 4417.002		
Versar INC.	SCALE 1"=24,000'	FIGURE 1



SITE LAYOUT MAP

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Doraville Yard Doraville, Georgia
JOB NO. 4417.002		
Versar INC.	SCALE: NONE	FIGURE 2

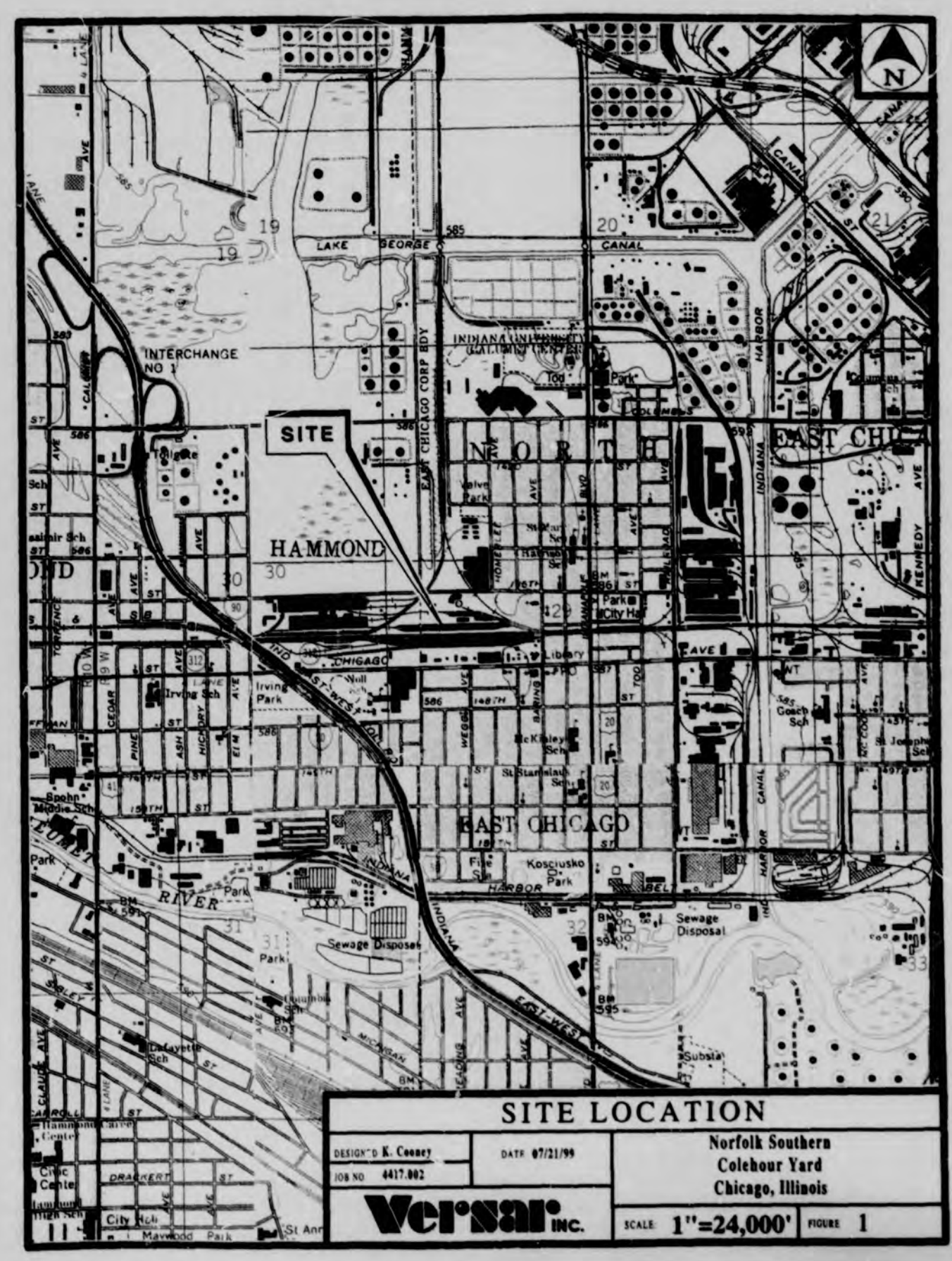
NY02 COLEHOUR YARD, CHICAGO, ILLINOIS

The Colehour Yard is a rail yard located in Chicago, Cook County, Illinois at 10600 Indianapolis Boulevard, at 108th Street and Indianapolis Boulevard. The facility operates as a flat switching classification yard and services industries around the area.

The rail yard comprises 43 lines of railroad track. The facility is located in an industrial area. The closest US Census tract indicates approximately 6,461 people reside in the area. The number of workers on duty at the facility at any one time is less than 15 workers.

Topography of the Colehour Yard facility is characterized by flat land. The USGS 7.5-minute Series maps of the Lake Calumet, Illinois, and Calumet City, Indiana-Illinois, Quadrangles show that the elevation of the property is approximately 585 feet above mean sea level. There are no surface waters on the site. The closest surface water to the facility is the Indiana Harbor Canal, approximately 2,000 feet to the east. Surrounding sites also appeared to be characterized by flat land, with elevations of approximately 585 feet above msl in all directions.

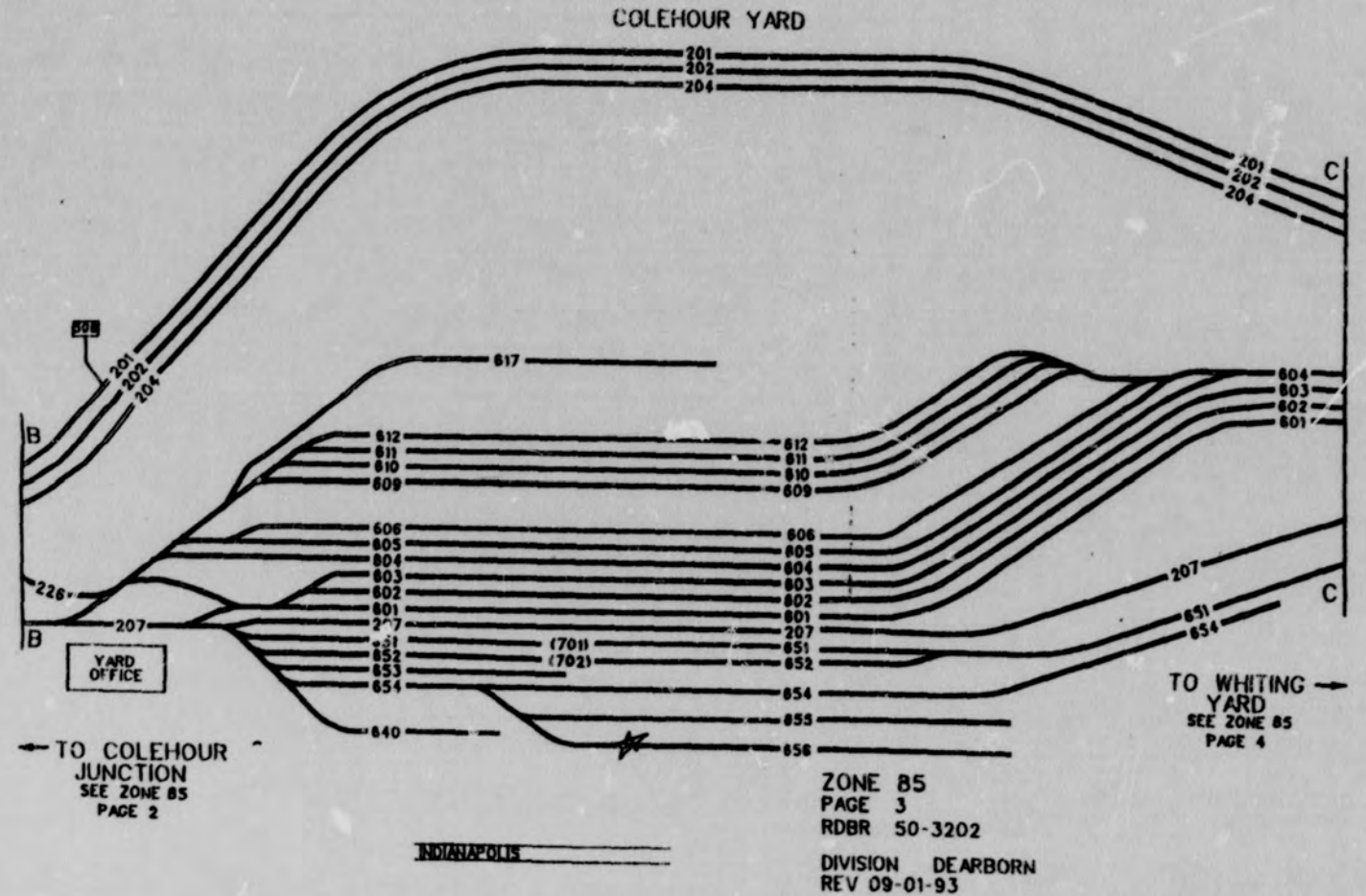
The Colehour Yard is located on Rail Line Rail Segment N-034 from Colehour to Calumet, IL. In June 1999, 10,844 cars were classified and 2,936 additional cars were transported through this yard. Line segment N-034 is currently not a Key Route. As a result of the acquisition of Conrail, the FEIS concluded that the N-034 rail line segment is not expected to experience a significant increase in hazardous materials transportation.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Colehour Yard Chicago, Illinois
JOB NO 4417.002		
Versar INC.	SCALE 1"=24,000'	FIGURE 1

HAMMOND IN



ZONE 85
PAGE 3
RDBR 50-3202

DIVISION DEARBORN
REV 09-01-93

SITE LAYOUT MAP

DESIGNED Cooley	DATE 07/21/99	Norfolk Southern Colehour Yard Chicago, Illinois
JOB NO.		
Versar INC.	SCALE NONE	FIGURE 2

NY03 FORT WAYNE YARD, FORT WAYNE, INDIANA

The Fort Wayne Yard is a rail yard located in Fort Wayne, Allen County, Indiana at 8111 Nelson Road, south of Lincoln Highway (US 30) between Hartzell and Estellou Roads. The facility operates as a flat switching yard for receiving, classification, and forwarding. The Fort Wayne Yard has the capacity for holding 1,325 cars.

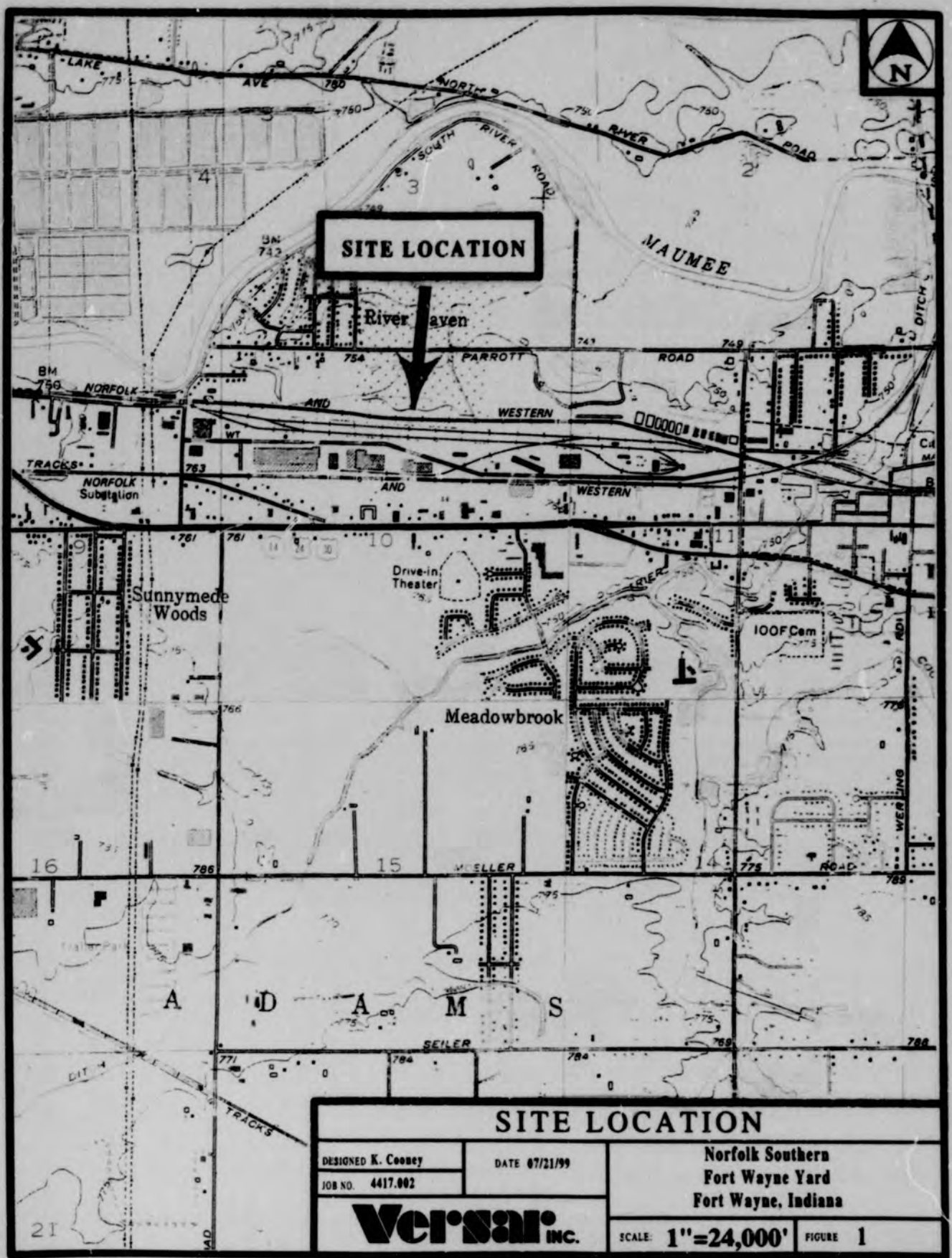
There are 27 lines of track located on the facility. The facility is located in an urban area. The closest US Census tract indicates approximately 2,798 people reside in the immediate area. Approximately 75 workers are employed at the Fort Wayne Yard. Yardmasters, Yard Clerks, and Yard switching crews are on duty 24 hours a day. Agency personnel are on duty Monday through Friday from 7:30 a.m. to 7:30 p.m.

Topography of the Ft. Wayne Yard is characterized by flat land. The USGS 7.5-minute Series map of the Fort Wayne, Indiana, Quadrangle shows that the elevation of the property is approximately 754 feet above mean sea level. An unnamed surface stream is located on the east side of the yard. The facility is situated approximately 4,000 feet south of the Maumee River. Surrounding sites also appeared to be characterized by flat land, with elevations of approximately 754 feet in all directions.

The Fort Wayne Yard is located on NS Rail Line Segments:

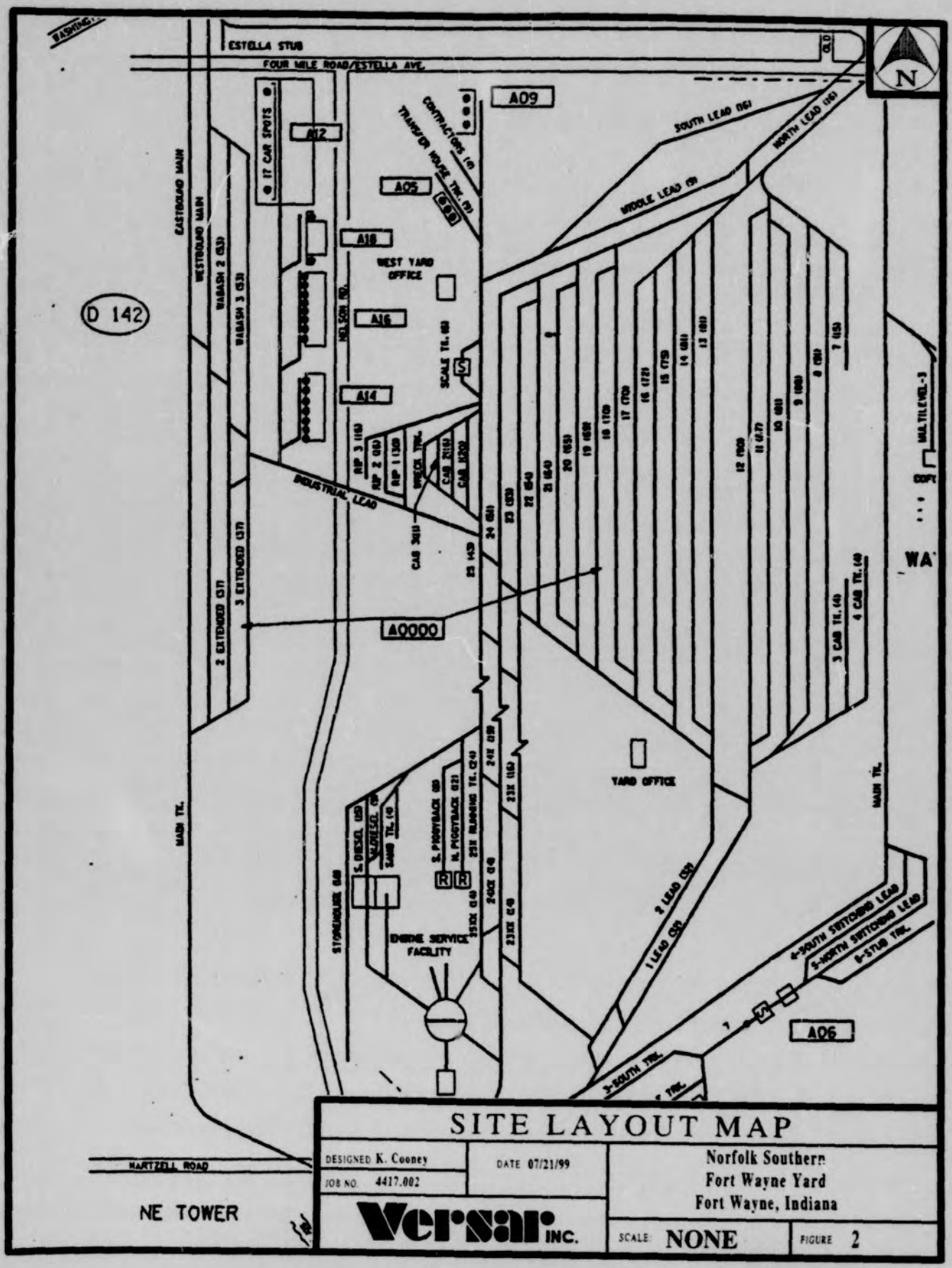
- N-041 from Butler, IN to Fort Wayne, IN
- N-044/N-046 from Fort Wayne, IN to Lafayette JCT, IN
- N-467 from Bellevue, OH to Fort Wayne, IN
- N-468 from Fort Wayne, IN to Hobart, IN
- N-484 from Fort Wayne, IN to Muncie, IN

For the first six months of 1999, an average of 60,352 cars were classified and 21,190 additional cars were transported through this yard each month. In June 1999, 60,149 cars were classified and 21,014 additional cars were transported through this yard. As a result of this acquisition of Conrail, the FEIS concluded that the N-041 rail line segment is a new Key R and Major Key Route, and the N-044 and N-046 rail line segments would become new Majo. Key Routes. Norfolk Southern is required by the STB to provide assistance for local emergency planning efforts, meet track standards for key routes, and coordinate emergency planning activities with local officials. Norfolk Southern has met the Board's requirements for this condition on these three rail line segments and is operating them according to the Board's provisions for Major Key Routes.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Fort Wayne Yard Fort Wayne, Indiana
JOB NO. 4417.002		
Versar INC.	SCALE: 1"=24,000'	FIGURE 1



SITE LAYOUT MAP

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Fort Wayne Yard Fort Wayne, Indiana
JOB NO. 4417.002		
Versar INC.	SCALE: NONE	FIGURE 2

NY04 LUTHER YARD, ST. LOUIS, MISSOURI

The Luther Yard is a rail yard located in St. Louis, Missouri at 7021 Hall Street. The facility operates as a flat switching yard with a capacity of approximately 1,660 cars.

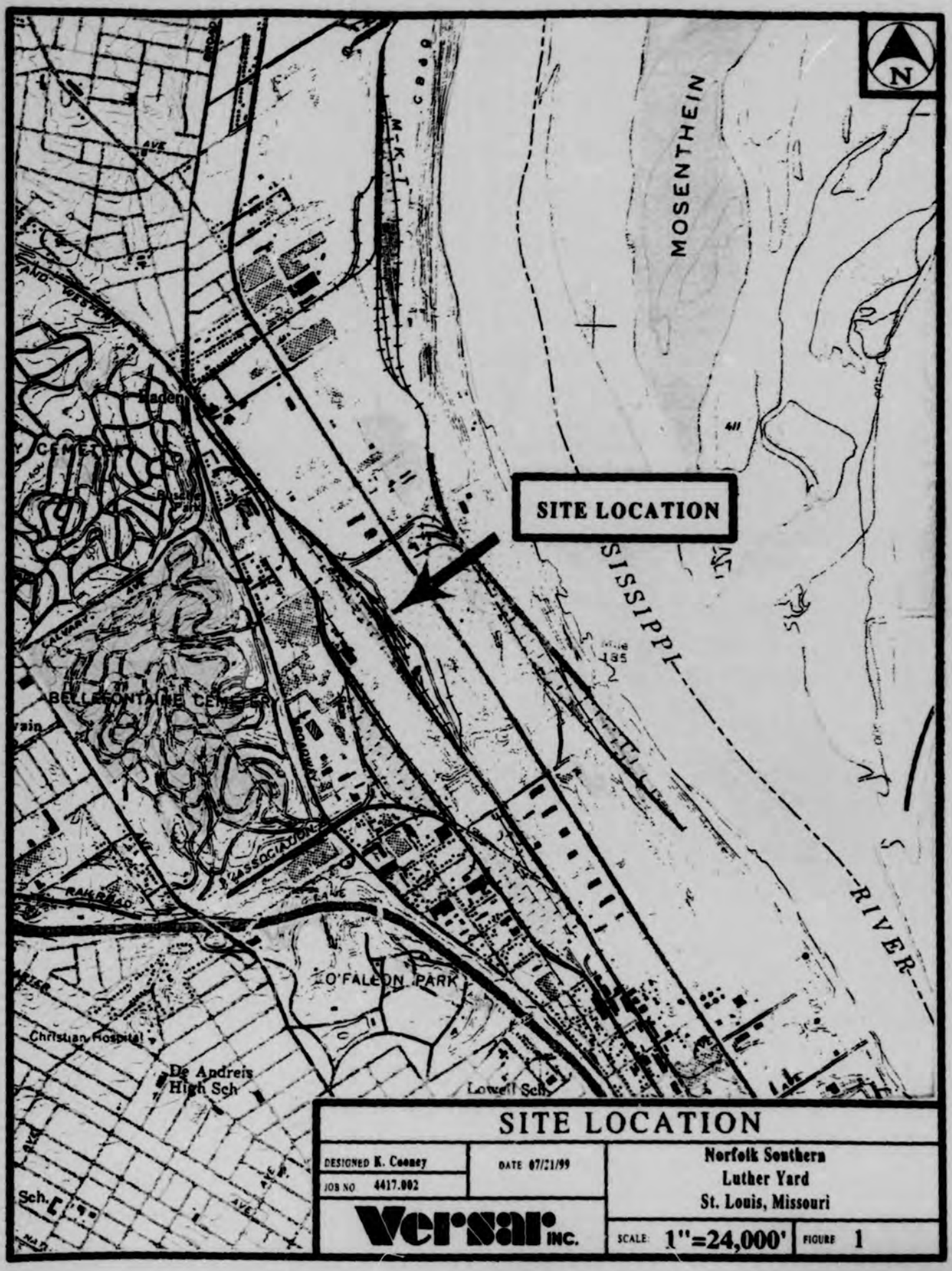
The rail yard comprises 38 lines of track. The facility is located in an urban/industrial area. The closest US Census tract indicates approximately 1,204 people reside in the area. There are 50 employees staffed at Luther. There are four Assistant General Yardmaster's at Luther. Mechanical and clerical employees work on all shifts.

Topography of the Luther Yard is characterized by flat land. The USGS 7.5-minute Series map of the Granite City, Missouri-Illinois, Quadrangle shows that the elevation of the property is approximately 450 feet above mean sea level. There are no surface waters on the site. The closest surface water to the yard is the Mississippi River, which is approximately 3,000 feet to the east. Surrounding sites also appeared to be characterized by flat land, with elevations of approximately 450 feet above msl in all directions.

The Luther Yard is located on NS Rail Line Segments:

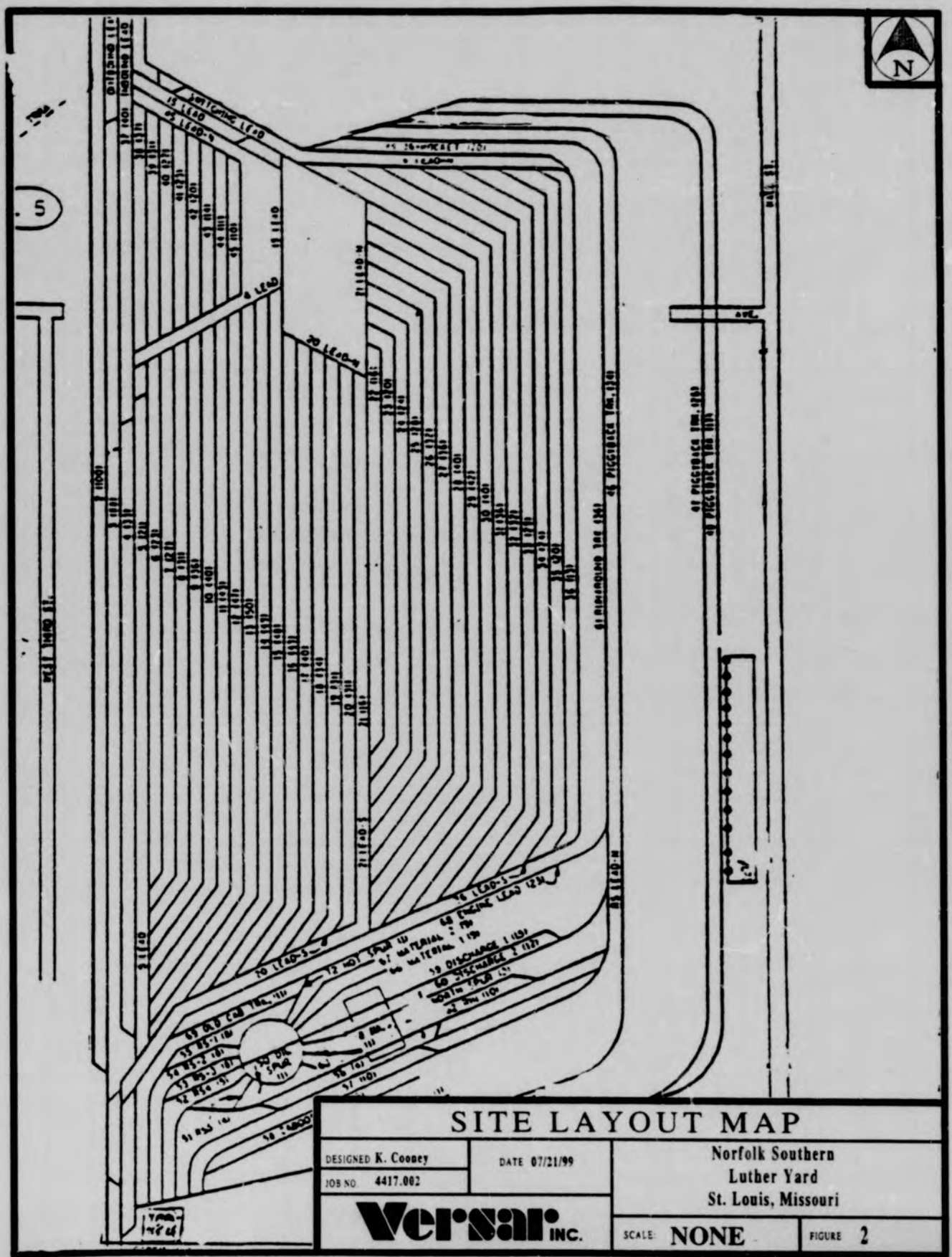
- N-494 from East St. Louis, IL to Luther, MO
- N-495 from Luther, MO to Moberly, MO

For the first six months of 1999, an average of 42,039 cars were classified and 9,420 additional cars were transported through this yard each month. In June, 1999, 51,549, cars were classified and 10,055 additional cars were transported through this yard. Rail line segments N-494 and N-495 are currently not Key Routes and are not projected to become new Key Routes or new Major Key Routes. As a result of the acquisition of Conrail, the FEIS concluded that these rail line segments are not expected to experience a significant increase in hazardous materials transportation.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Luther Yard St. Louis, Missouri
JOB NO 4417.002		
Versar INC.	SCALE: 1"=24,000'	FIGURE 1


N
SITE LAYOUT MAP
DESIGNED K. Cooney
DATE 07/21/99
JOB NO. 4417.002
Versar INC.
Norfolk Southern
Luther Yard
St. Louis, Missouri
SCALE: NONE
FIGURE 2

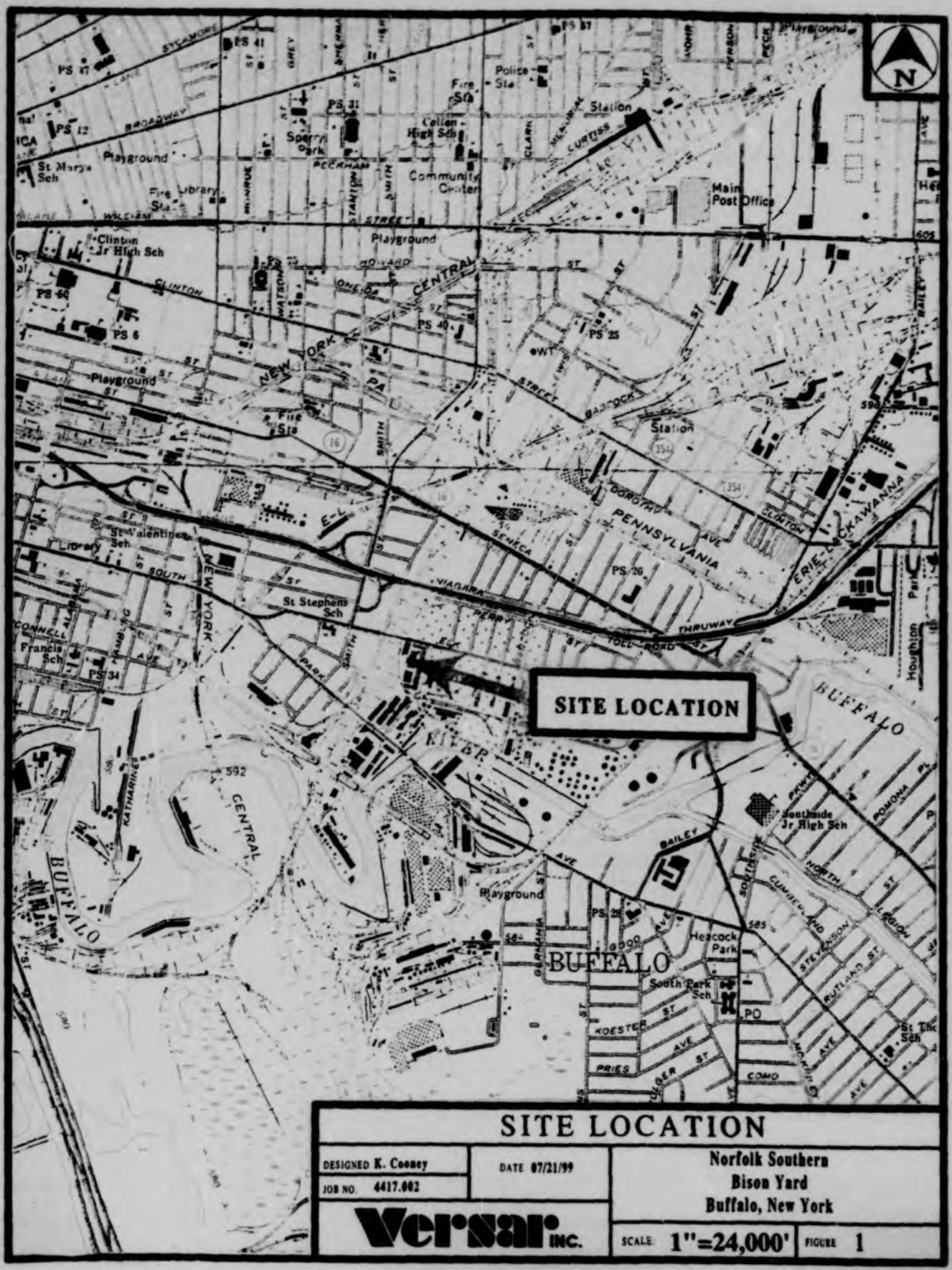
NY05 BISON YARD, BUFFALO, NEW YORK

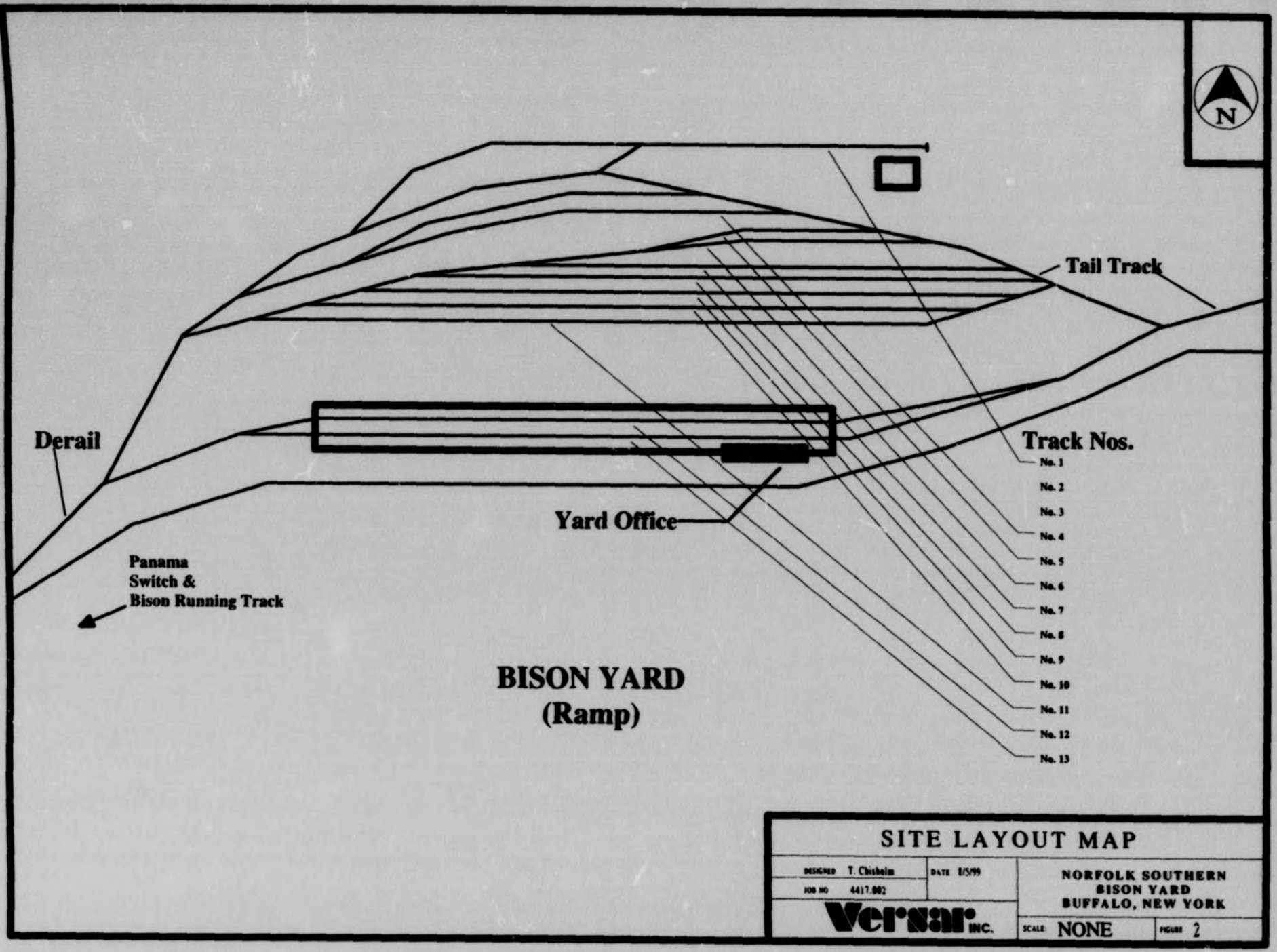
The Bison Yard is a rail yard located in Buffalo Junction, Erie County, New York at 27 Owahn Place. The Bison Yard has 9 storage tracks used to support the various functions of the yard and support the NS intermodal facility, Triple Crown facility, lumber transfer facility, and auto facility in Buffalo.

The rail yard comprises 9 lines of railroad track. The facility is located in an urban/industrial area. The closest US Census tract indicates there are approximately 579 people residing in the area. The rail yard employs a total of 6 workers. The maximum number of employees working at the facility at any one time is 6.

Topography of the Bison Yard is characterized by flat land. The USGS 7.5-minute Series map of the Buffalo S.E., New York, Quadrangle shows that the elevation of the property is approximately 580 feet above mean sea level. There are no surface waters on the site. The closest surface water to the yard is the Buffalo River, which is located approximately 1,000 feet to the south. Surrounding sites also appeared to be characterized by flat land, with elevations of approximately 580 feet in all directions.

The Bison Yard is located on Rail Line Segment N-065 from Corning, NY to Buffalo, NY. For the first six months of 1999, an average of 27,974 cars were classified and 2,589 additional cars were transported through this yard each month. In June, 1999, 57,193 cars were classified and 9,506 additional cars were transported through this yard. As a result of the acquisition of Conrail, the FEIS concluded that the N-065 rail line segment is a new Key Route. Norfolk Southern is required by the STB to provide new key routes with wayside defect detectors, meet minimum standards for track maintenance, and coordinate emergency planning activities with local officials. Norfolk Southern has met the Board's requirements for this condition and is operating this rail line segment according to the provisions for Key Routes.


SITE LOCATION
BUFFALO
Playground
Community Center
Main Post Office
Police Sta
Fire Sta
Station
Clinton Jr High Sch
St Marys Sch
St Valentines Sch
St Stephens Sch
Francis Sch
Southside Jr High Sch
South Park Sch
Heacock Park
PS 6
PS 12
PS 25
PS 26
PS 34
PS 40
PS 41
PS 47
PS 60
CENTRAL
NEW YORK
PENNSYLVANIA
ERIE-LACKAWANNA
BROADWAY
CLINTON
SENECA
NIAGARA
THRUWAY
BAILEY
SOUTH PARK AVE
KOESTER
PRIES
COMO
CURTISS
SITE LOCATION
DESIGNED K. Cooney
DATE 07/21/99
JOB NO. 4417.002
Versar INC.
Norfolk Southern
Bison Yard
Buffalo, New York
SCALE 1"=24,000'
FIGURE 1



SITE LAYOUT MAP

DESIGNED T. Chisholm	DATE 8/5/99	NORFOLK SOUTHERN BISON YARD BUFFALO, NEW YORK
JOB NO 4417.002		
Versar INC.	SCALE NONE	FIGURE 2

NY06 CONNEAUT YARD, CONNEAUT, OHIO

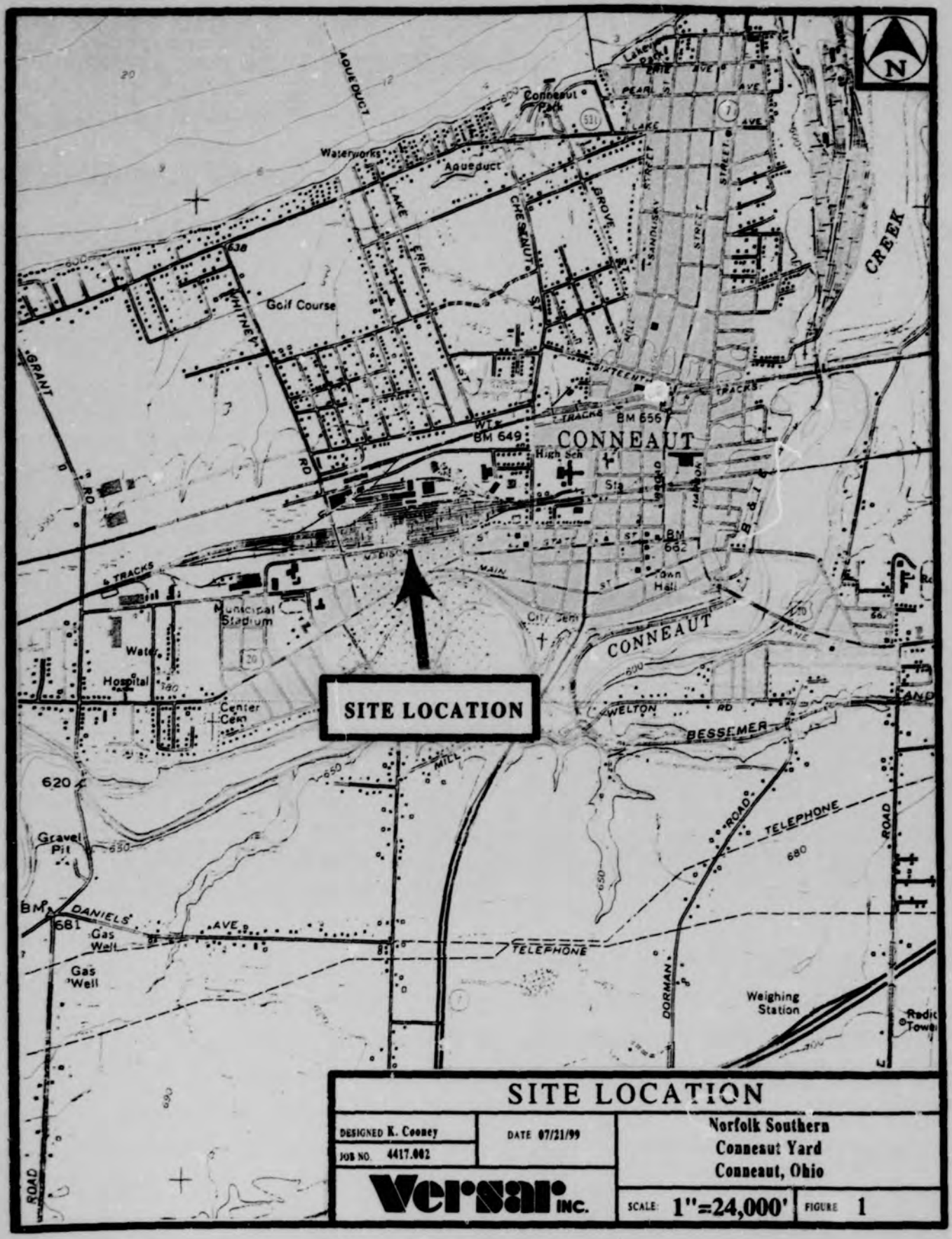
The Conneaut Yard is a rail yard located in Conneaut, Ashtabula County, OH. The facility is located near the intersection of Chestnut Street and Madison Street, at 345 Chestnut Street. The facility operates as a crew change point for all Buffalo and Cleveland District road trains. Crews perform general switching, some industry switching, road train set-offs and pick-ups at this location.

The rail yard comprises 27 lines of railroad track. The facility is located in a commercial/residential. The closest US Census tract indicates there are approximately 4,546 people residing in the area. The rail yard employs a total of 50 workers. The maximum number of employees working at the facility at any one time is 20.

Topography of the Conneaut Yard is characterized by flat land. The USGS 7.5-minute Series map of the Conneaut, Ohio, Quadrangle shows that the elevation of the property is approximately 650 feet above mean sea level. There are no surface waters on the property. The closest surface water to the site is the Conneaut Creek, which is located approximately 1,200 feet to the south. Surrounding sites also appeared to be characterized by flat land, with an elevation of approximately 650 feet in all directions.

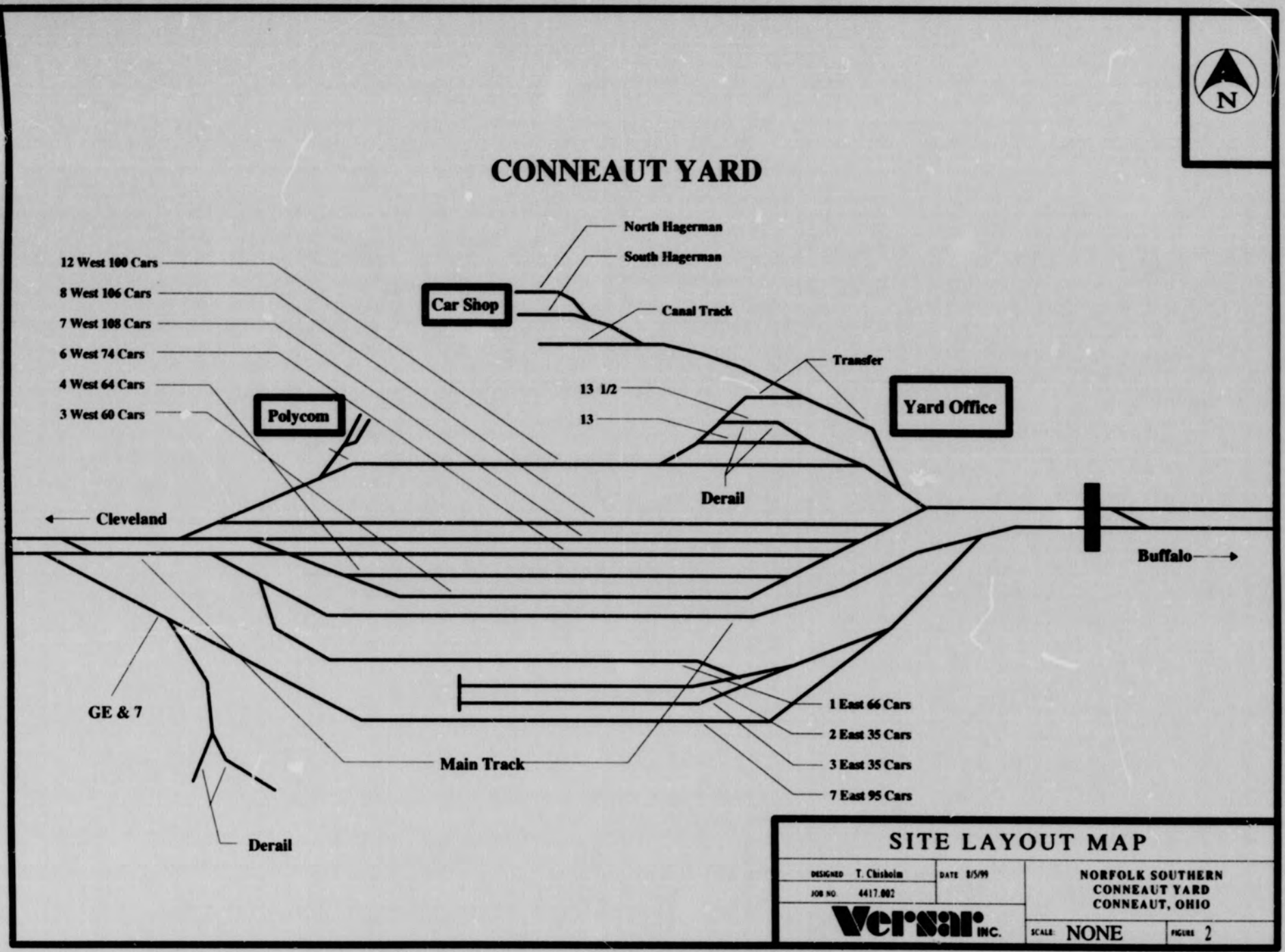
The Conneaut Yard is located on Rail Line Segment N-070 from Buffalo, NY to Ashtabula, OH. The FEIS reports the number of rail cars handled per day at the facility will increase from 30 to 74 cars per day.

On NS, Conneaut Yard is included as part of line-of-road operations. Car accounting does not track monthly car classifications at this facility. As a result of the acquisition of Conrail, the FEIS concluded that the N-070 rail line segment is a new Key Route and a Major Key Route. Norfolk Southern is required by the STB to provide assistance to local emergency planning efforts, meet track standards for Key Routes, and coordinate emergency planning activities with local officials. NS has met the Board's requirements for this condition on this rail line and is operating this line segment according to the Board's provisions for Major Key Routes.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Conneaut Yard Conneaut, Ohio
JOB NO. 4417.002		
Versar INC.	SCALE: 1"=24,000'	FIGURE 1


CONNEAUT YARD
N
North Hagerman
South Hagerman
Car Shop
Canal Track
12 West 100 Cars
8 West 106 Cars
7 West 108 Cars
6 West 74 Cars
4 West 64 Cars
3 West 60 Cars
Polycom
Transfer
13 1/2
13
Yard Office
Derail
Cleveland
Buffalo
GE & 7
1 East 66 Cars
2 East 35 Cars
3 East 35 Cars
7 East 95 Cars
Main Track
Derail
SITE LAYOUT MAP
DESIGNED T. Chisholm
DATE 8/5/99
JOB NO 4417.002
Versar INC.
NORFOLK SOUTHERN
CONNEAUT YARD
CONNEAUT, OHIO
SCALE: NONE
FIGURE 2

NY07 HOMESTEAD YARD, TOLEDO, OHIO

The Homestead Yard is a rail yard located in Toledo, Lucas County, Ohio at 3830 Corduroy Road. The facility is the main set-off and pick up yard of the Toledo Terminal. The facility also serves as a switching yard that supports many Toledo industries and interchanges.

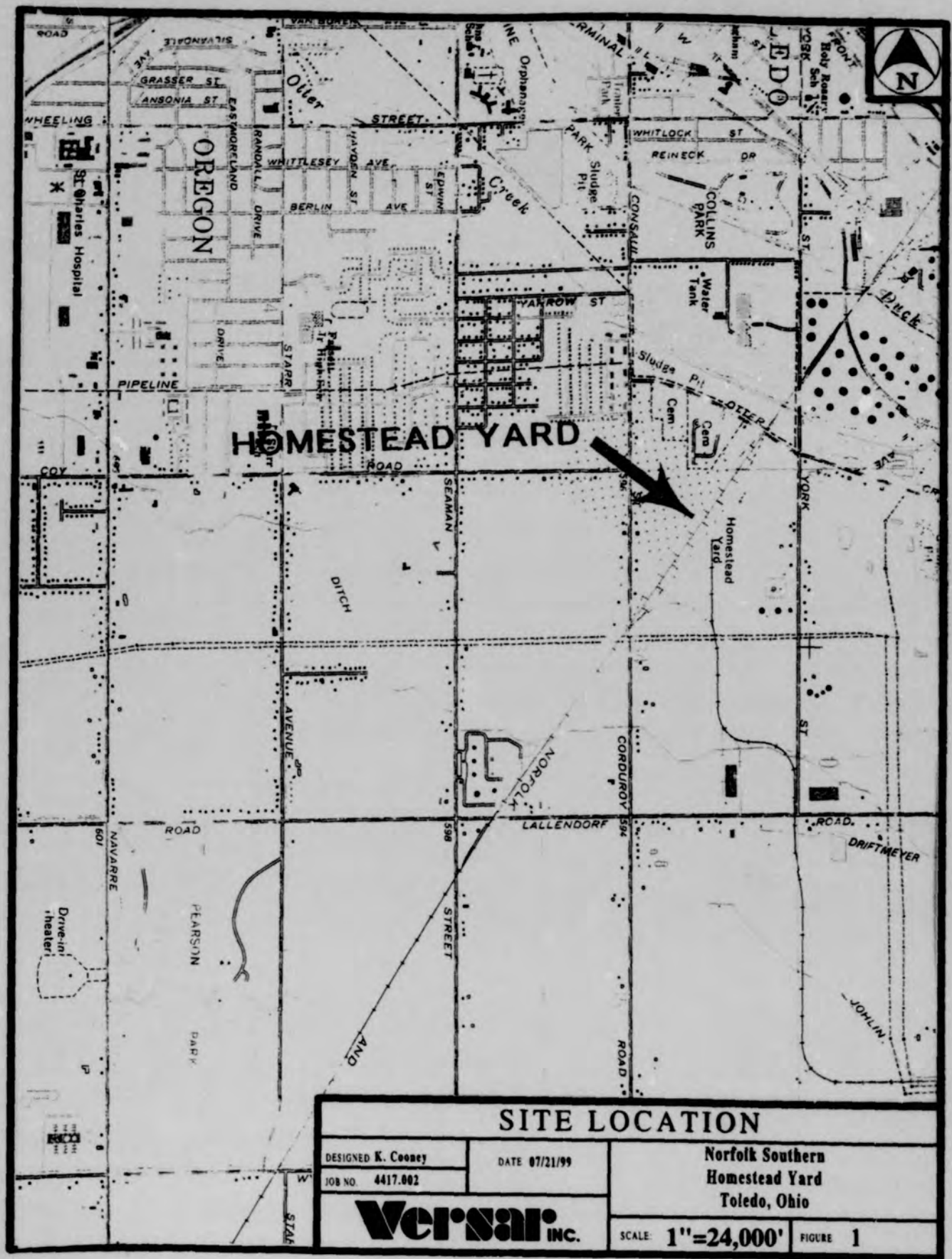
The rail yard comprises 22 lines of railroad track. The facility is located in an urban/industrial area. The closest US Census Tract indicates there are approximately 3,083 persons residing in the area. The peak number of workers on duty at the facility is 29.

Topography of the Homestead Yard is characterized by flat land. The USGS 7.5-minute Series map of the Oregon, Ohio, Quadrangle shows that the elevation of the property is approximately 600 feet above mean sea level. There are no surface waters on the property. The closest surface water to the site is the Otter Creek, which is located approximately 2,000 feet to the west. The Maumee River is located approximately 2 miles to the northwest. Surrounding sites also appeared to be characterized by flat land, with an elevation of approximately 600 feet in all directions.

The Homestead Yard is located on NS Rail Line Segments:

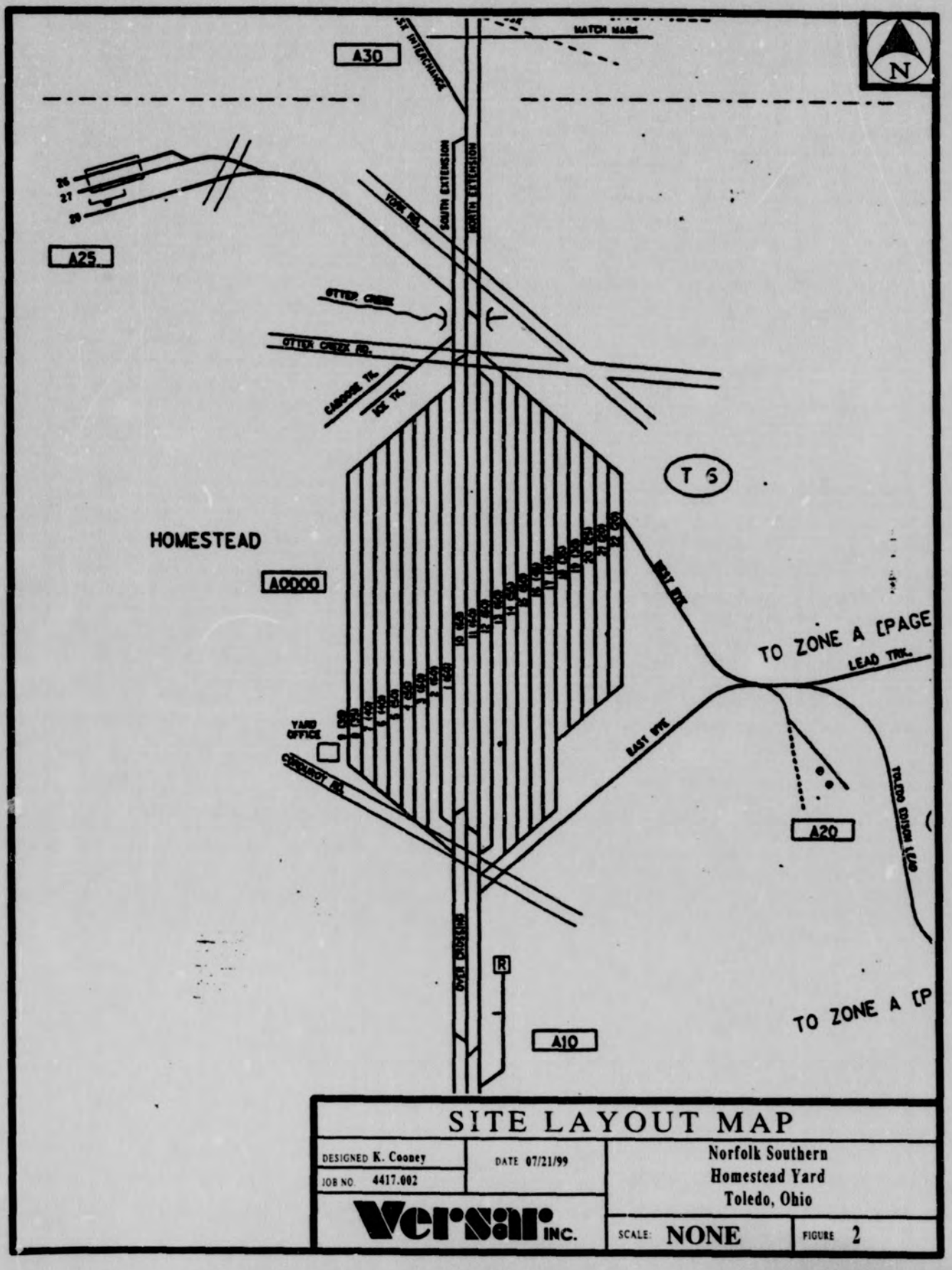
- N-482 from Milan, MI to Homestead, OH
- N-483 from Homestead, OH to Oak Harbor, OH

For the first six months of 1999, an average of 24,268 cars were classified and 3,025 additional cars were transported through this yard each month. In June, 1999, 18,395 cars were classified and 2,806 additional cars were transported through this yard. Rail line segments N-482 and N-483 are currently not Key Routes and are not projected to become new Key Routes or new Major Key Routes. As a result of the acquisition of Conrail, the FEIS concluded that these rail line segments are not expected to experience a significant increase in hazardous materials transportation.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Homestead Yard Toledo, Ohio
JOB NO. 4417.002		
Versar INC.	SCALE 1"=24,000'	FIGURE 1


A30
A25
A20
A10
A00000
HOMESTEAD
T 5
N
SOUTH EXTENSION
NORTH EXTENSION
YARD OFFICE
TO ZONE A [PAGE
TO ZONE A [P
LEAD TRK.
WEST BYE
EAST BYE
TOLEDO EDISON LEAD
OVHD CROSSING
SITE LAYOUT MAP
DESIGNED K. Cooney
DATE 07/21/99
JOB NO. 4417.002
Versar INC.
Norfolk Southern
Homestead Yard
Toledo, Ohio
SCALE: NONE
FIGURE 2

NY08 AIRLINE JUNCTION YARD, TOLEDO, OHIO

The Airline Junction Yard is a rail yard located in Toledo, Lucas County, Ohio located in south central Toledo at 2101 Hill Avenue.

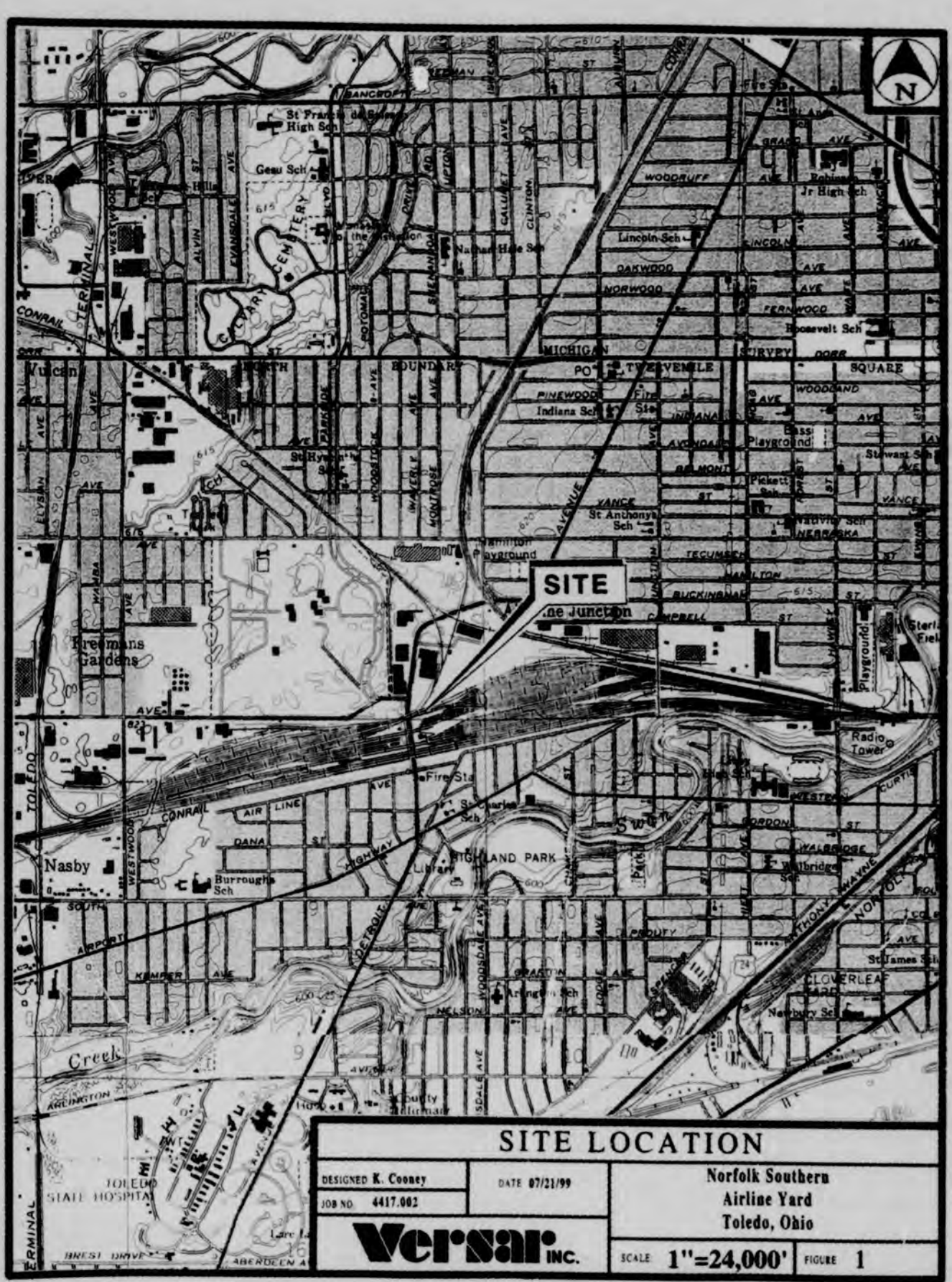
The rail yard comprises 15 lines of railroad track. The facility is located in an urban/industrial/residential area. The closest US Census tract indicates there are approximately 1,660 people residing in the area. The peak number of workers on duty at the facility is 20.

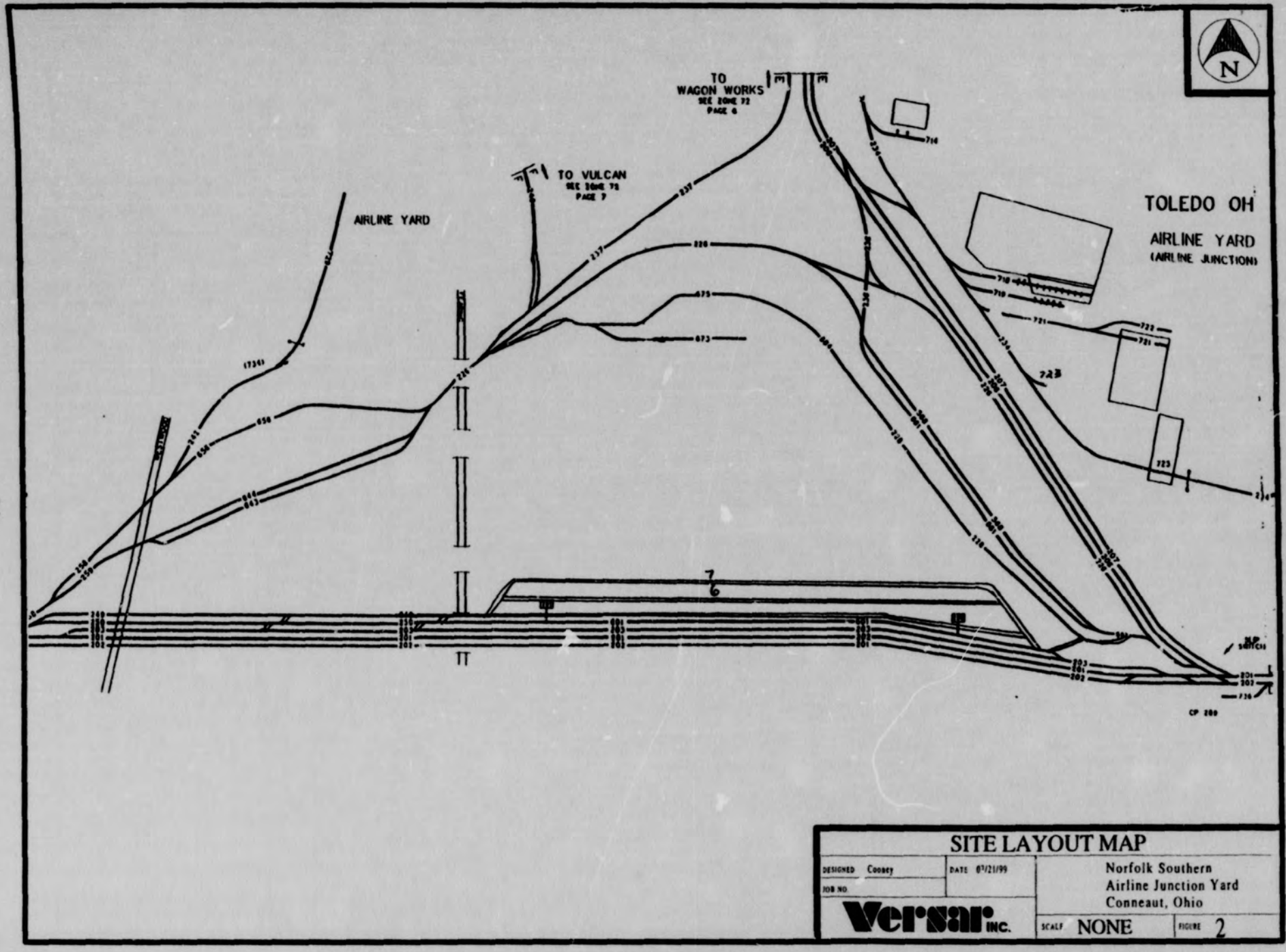
Topography of the Airline Junction Yard facility is characterized by flat land. The USGS 7.5-minute Series maps of the Toledo, Ohio, and Rossford, Ohio-Michigan, Quadrangles show that the elevation of the property is approximately 600 feet above mean sea level. There are no surface waters on the property. The closest surface water to the site is the Swan Creek, which is located approximately 3,300 feet to the south. Surrounding sites also appeared to be characterized by flat land, with an elevation of approximately 600 feet in all directions.

The Airline Junction Yard is located on NS Rail Line Segments:

- N-086 from Miami, OH to Airline, OH
- N-295 from Airline, OH to River Rouge, MI
- N-303 from Airline, OH to Butler, IN

In June, 1999, 18,895 cars were classified and 5,341 additional cars were transported through this yard. Rail line segment N-295 is currently not a Key Route and is not projected to become new Key Route or a new Major Key Route. Rail line segments N-086 and N-303 are currently Key Routes. As a result of the acquisition of Conrail, the FEIS concluded that these rail line segments are not expected to experience a significant increase in hazardous materials transportation.


N
SITE
Freemans Gardens
Nasby
Burroughs Sch
HIGHLAND PARK
Library
Fire Sta
Radio Tower
Playground
Lincoln Sch
Roosevelt Sch
Indiana Sch
St Anthonys Sch
Nathan Hale Sch
Geau Sch
Arlington Sch
Newbury Sch
Pickett Sch
Walbridge Sch
Vulcan
CONRAIL
AIR LINE
DANA
HIGHWAY
TERMINAL
TOLEDO STATE HOSPITAL
Creeks
SITE LOCATION
DESIGNED K. Cooney
DATE 07/21/99
JOB NO. 4417.002
Versar INC.
Norfolk Southern
Airline Yard
Toledo, Ohio
SCALE 1"=24,000'
FIGURE 1


TO
WAGON WORKS
SEE ZONE 72
PAGE 6
TO VULCAN
SEE ZONE 72
PAGE 7
AIRLINE YARD
TOLEDO OH
AIRLINE YARD
(AIRLINE JUNCTION)
N
SITE LAYOUT MAP
DESIGNED Cooley
DATE 07/21/99
JOB NO.
Versar INC.
Norfolk Southern
Airline Junction Yard
Conneaut, Ohio
SCALE NONE
FIGURE 2

NY09 HARRISBURG YARD, HARRISBURG, PENNSYLVANIA

The Harrisburg Yard is a rail yard located in Harrisburg, Dauphin County, Pennsylvania on Park Drive, between Mallay Street and I-81 at 3322 Industrial Road.

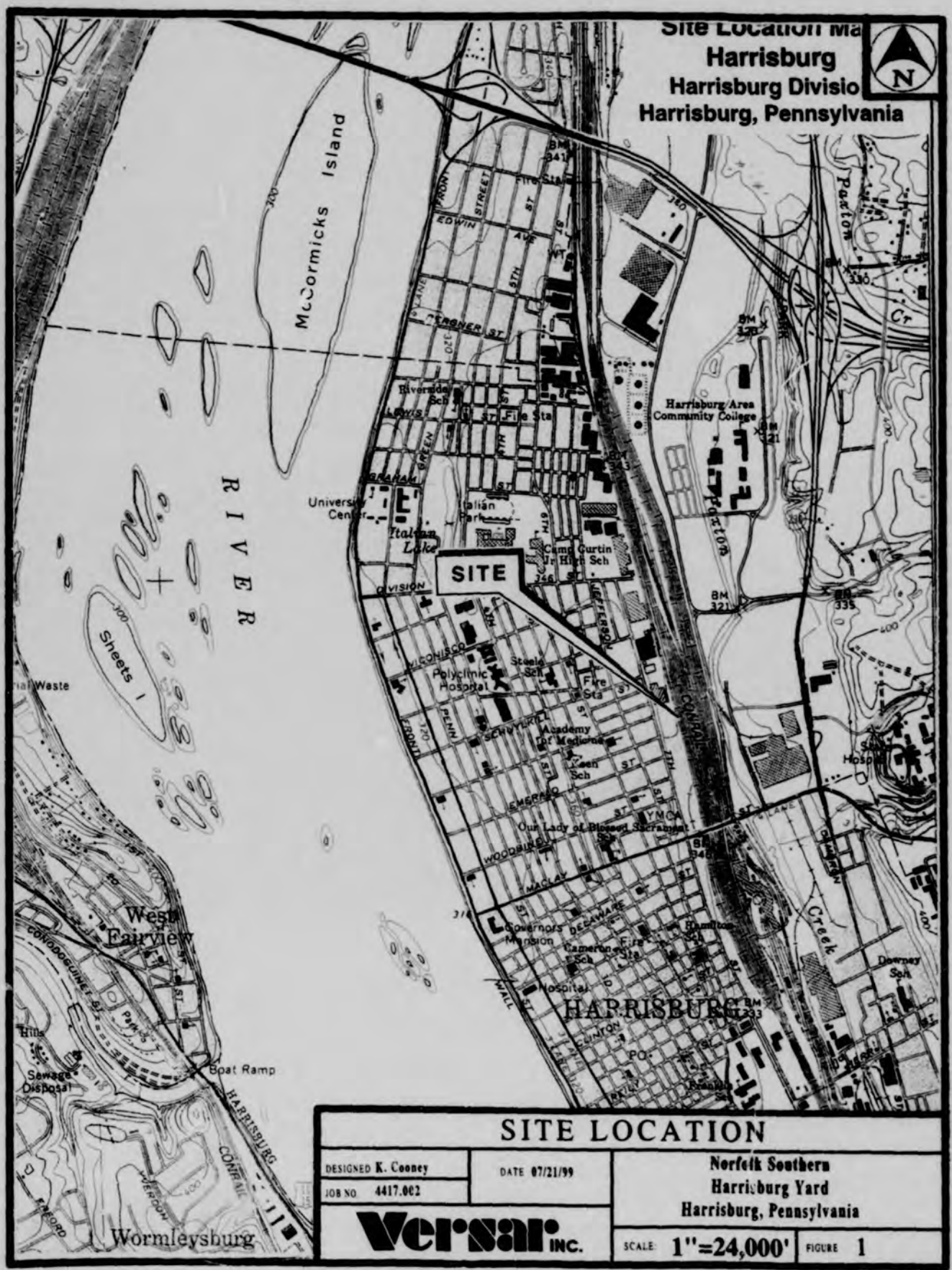
The rail yard comprises 28 lines of railroad track. The facility is located in an industrial area. The closest US Census tract indicates there are approximately 3,042 people residing in the area. The peak number of workers on duty at the facility is 100.

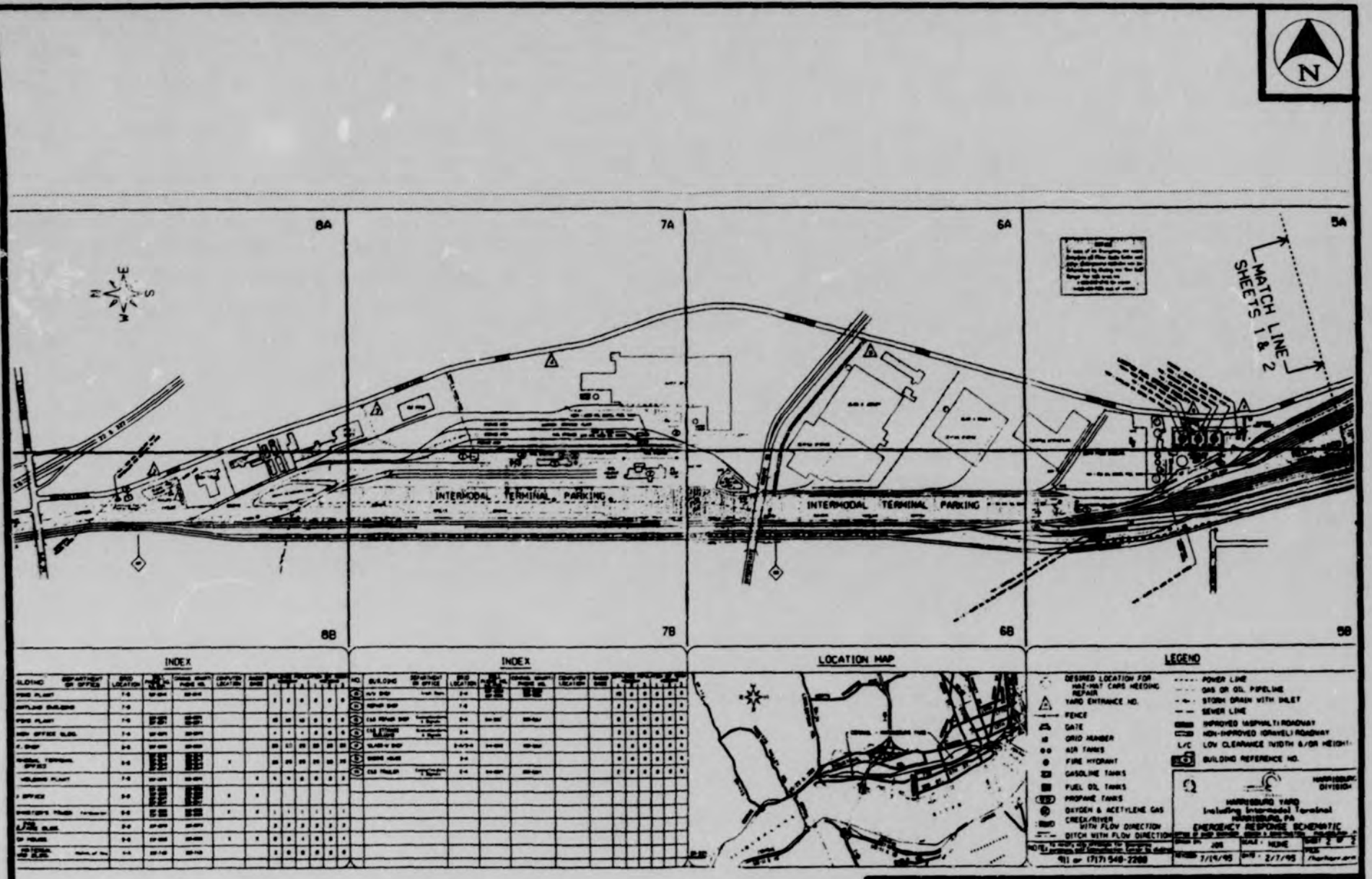
Topography of the Harrisburg Facility is characterized by flat land. The USGS 7.5-minute Series map of the Harrisburg West, Pennsylvania, Quadrangle shows that the elevation of the property is approximately 330 feet above mean sea level. The facility is bounded by the Paxton Creek to the east. Surrounding sites also appeared to be characterized by flat land, with an elevation of approximately 610 feet to the north and east, 600 feet to the south and southwest, and 610 feet to the west.

The Harrisburg Yard is located on NS Rail Line Segments:

- N-090 from Rutherford, PA to Harrisburg, PA
- N-091 from Harrisburg, PA to Hagerstown, PA
- N-092 from Harrisburg, PA to Marysville, PA
- N-093 from Harrisburg, PA to Shocks, PA

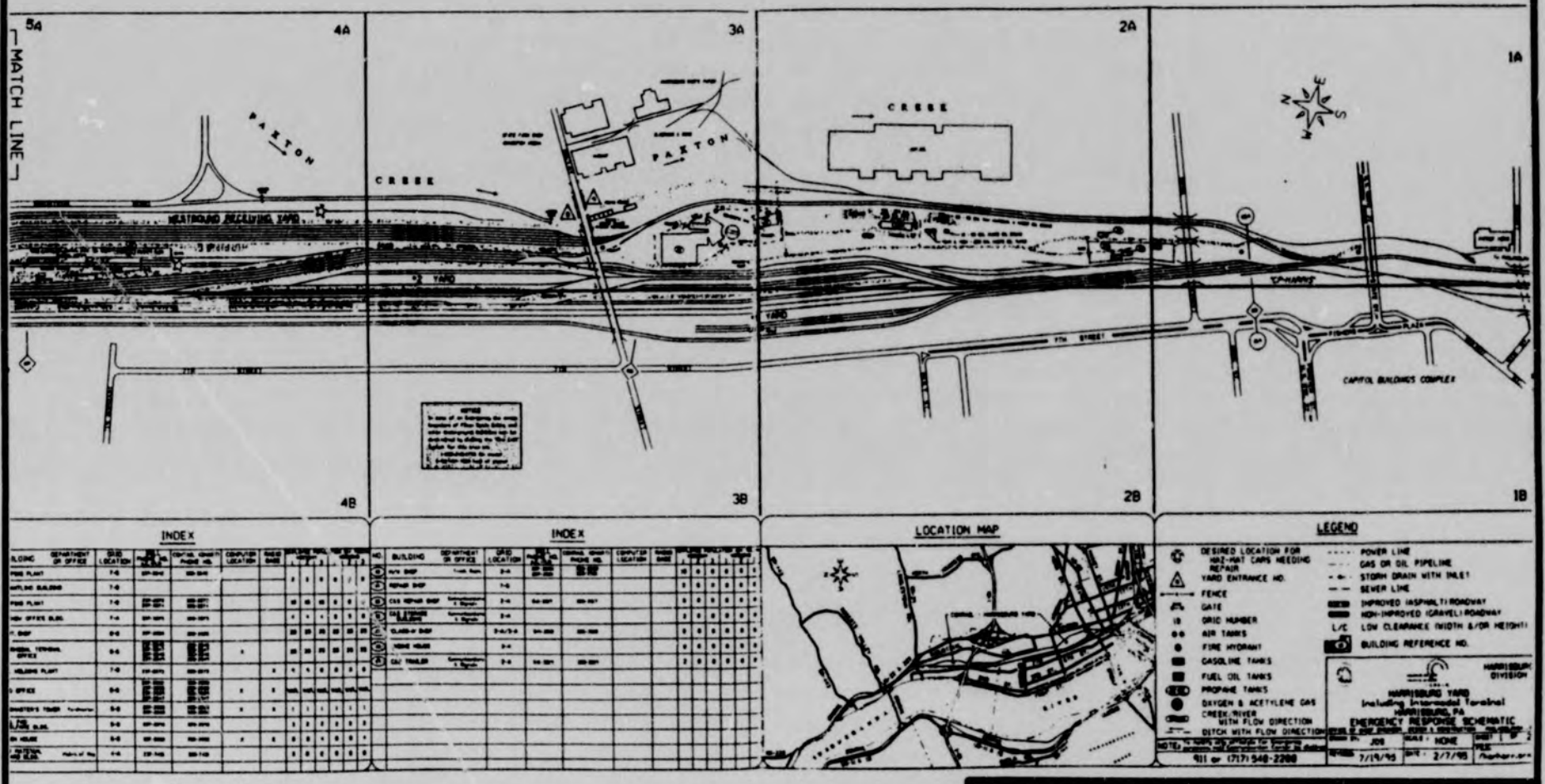
In June, 1999, 27,751 cars were classified and an additional 8,699 cars were transported through this yard. Rail line segment N-093 is currently not a Key Route and is not projected to become a new Key Route or a new Major Key Route. Rail line segments N-090, N-091, and N-092 are currently Key Routes. As a result of the acquisition of Conrail, the FEIS concluded that these rail line segments are not expected to experience a significant increase in hazardous materials transportation.


Site Location Ma
Harrisburg
Harrisburg Divisio
Harrisburg, Pennsylvania
N
McCormicks Island
RIVER
SITE
HARRISBURG
West Fairview
Wormleysburg
Boat Ramp
Sewage Disposal
Hills
Harrisburg Area Community College
Riverside Sch
Fire Sta
Italian Park
Italian Lake
Camp Curtin Jr High Sch
Polyclinic Hospital
Steele Sch
Academy of Medicine
Keen Sch
YMCA
Our Lady of Blessed Sacrament
Governors Mansion
Cameron Sch
Hamilton Sch
Downey Sch
Paxton Creek
Sheets 1
SITE LOCATION
DESIGNED K. Cooney
DATE 07/21/99
JOB NO 4417.002
Versar INC.
Norfolk Southern
Harrisburg Yard
Harrisburg, Pennsylvania
SCALE 1"=24,000'
FIGURE 1



SITE LAYOUT MAP

DESIGNED Coobey	DATE 07/21/99	Norfolk Southern Harrisburg Yard, Part 1 Harrisburg, Pennsylvania
JOB NO.		
Versar INC.	SCALE NONE	FIGURE 2



SITE LAYOUT MAP

DESIGNED Cooney	DATE 07/21/99	Norfolk Southern Harrisburg Yard, Part 2 Harrisburg, Pennsylvania
JOB NO.		
Versar INC.	SCALE NONE	FIGURE 2

APPENDIX B

NORFOLK SOUTHERN INTERMODAL FACILITIES IDENTIFIED BY STB IN DECISION 89 AS SUBJECT TO ENVIRONMENTAL CONDITION 6

NORFOLK SOUTHERN INTERMODAL FACILITIES

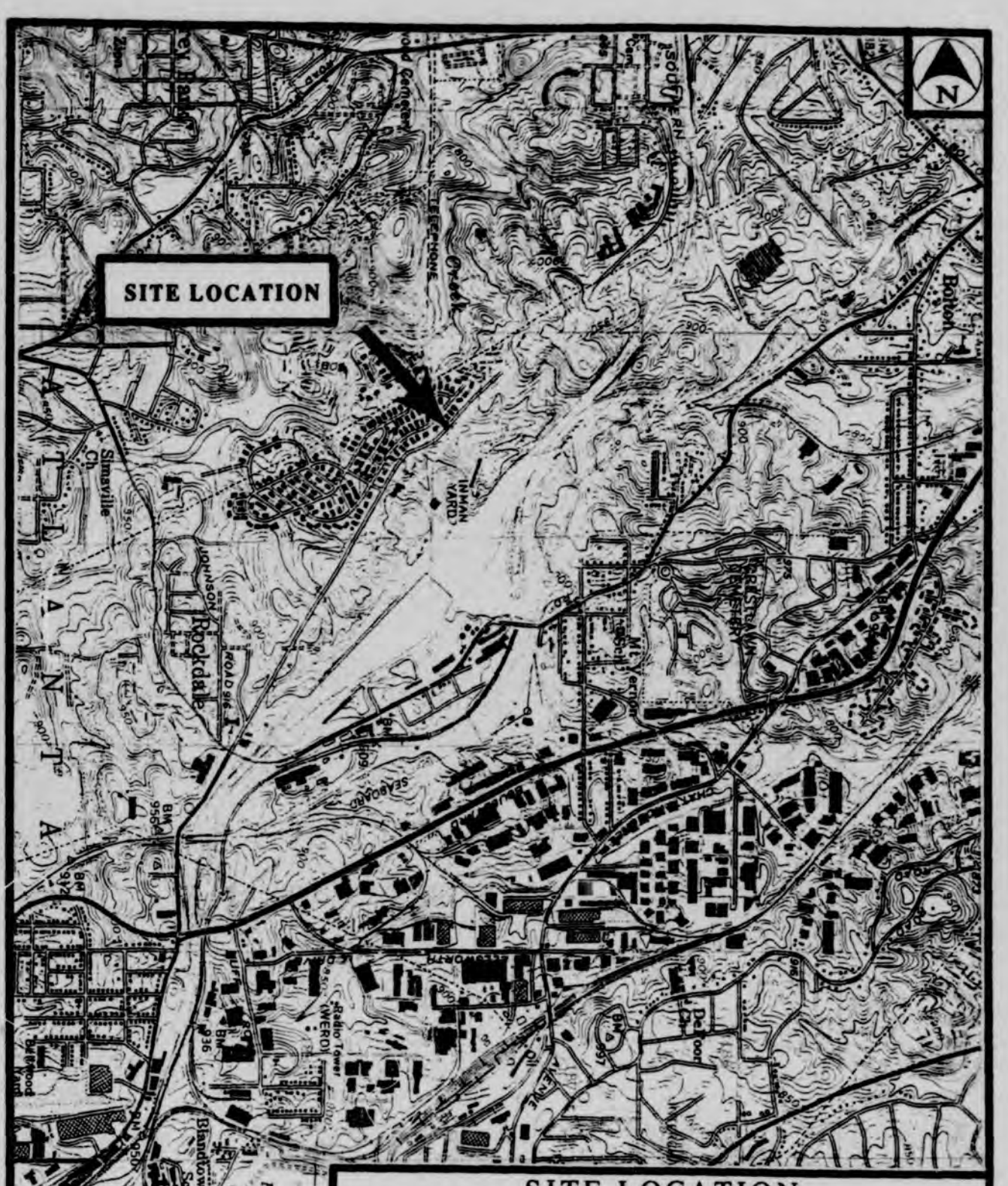
NM01 INMAN, ATLANTA, GEORGIA

Inman Intermodal Facility is located in northern Atlanta, Fulton County, Georgia. The intermodal facility is located on the south side of Marietta Road in Atlanta. Perry Boulevard runs along the facility on the southwest side.

The Inman facility includes 7 intermodal tracks, 8 tracks for receiving, 16 forwarding tracks, 9 local yard tracks, and 65 class yard tracks. There is one single main line, which runs down the West Side of the Inman Yard. The intermodal facility is located in an urban/industrial area. The closest US Census tract indicates there are approximately 2,693 people residing in the area. The average peak number of workers on duty at the facility is 125.

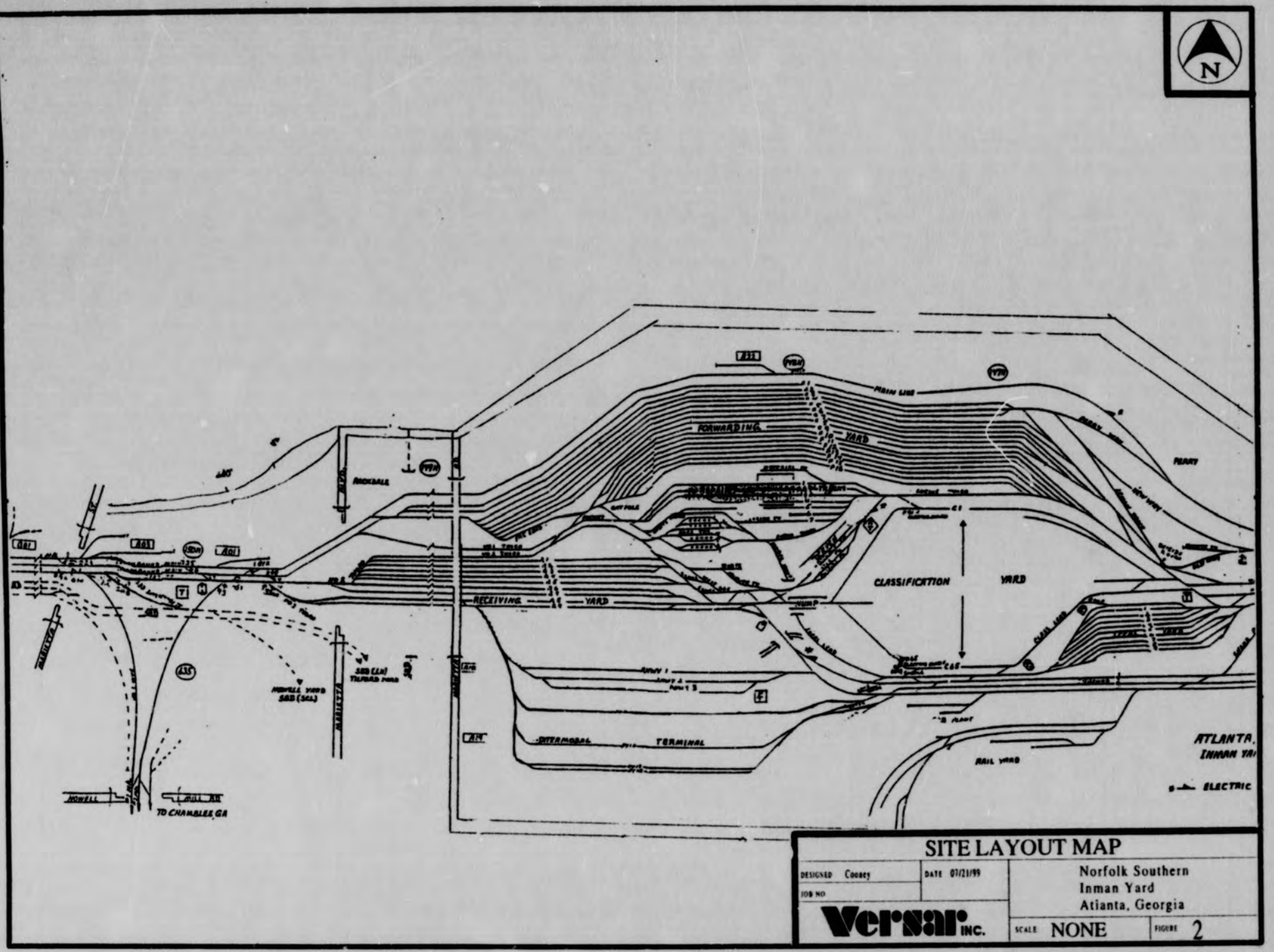
Topography of the Inman Yard is characterized by flat land. The USGS 7.5-minute Series map of the Northwest Atlanta, Georgia, Quadrangle shows that the elevation of the property is approximately 950 feet above mean sea level. There are no surface waters on the site. The closest surface water to the facility is the Proctor Creek, approximately 2,200 feet to the southwest. Surrounding sites also appeared to be characterized by flat land, with an elevation of approximately 900 feet to the northeast, 950 feet to the northwest, 900 feet to the east and south, and 950 feet to the west.

Inman Intermodal Facility is located on Rail Line Segment N-332 from Austell to Howell, GA. For the first six months of 1999, an average of 69,940 cars were classified and 21,446 additional cars were transported through this facility each month. In June, 1999, 69,968 cars were classified and 20,812 additional cars were transported through this facility. Rail line segment N-332 is currently a Key Route. As a result of the acquisition of Conrail, the FEIS concluded that the N-332 rail line segment is not expected to experience a significant increase in hazardous materials transportation.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Inman Intermodal Atlanta, Georgia
JOB NO 4417.002		
Versar INC.	SCALE 1"=24,000'	FIGURE 1



SITE LAYOUT MAP

DESIGNED Cooney	DATE 07/21/99	Norfolk Southern Inman Yard Atlanta, Georgia
JOB NO		
Versar INC.	SCALE NONE	FIGURE 2

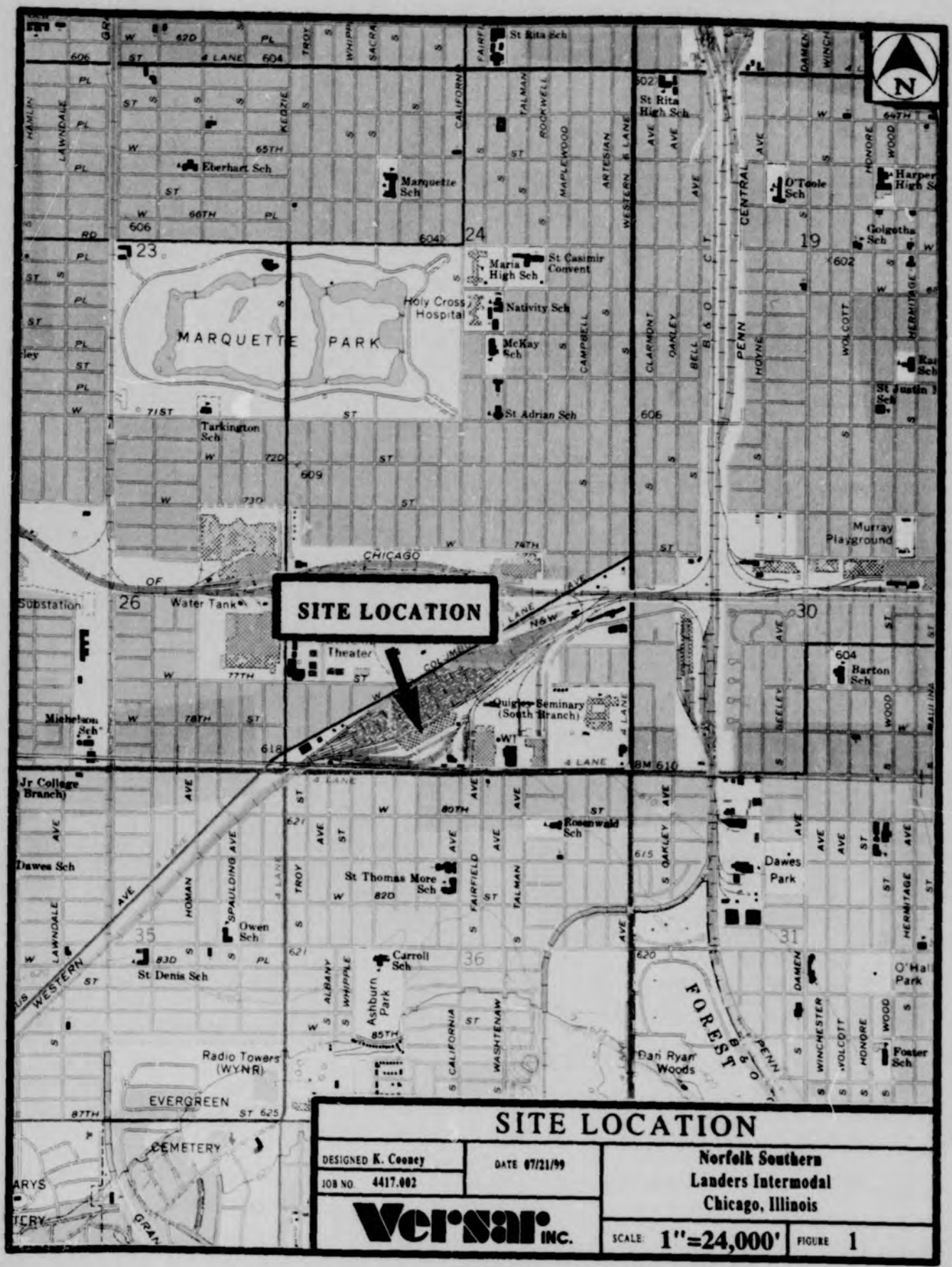
NM02 LANDERS, CHICAGO, ILLINOIS

Landers Intermodal Facility is located in southwest Chicago, Cook County, Illinois. The intermodal facility is located on Western Avenue north of 79th Street on the southwest side of Chicago. The facility operates as an intermodal facility and is operated 24 hours a day.

The Landers facility comprises 18 lines of railroad track. The intermodal facility is located in an urban/residential area. The closest US Census tract indicates there are approximately 4,142 people residing in the area. The average peak number of workers on duty at the facility is 125.

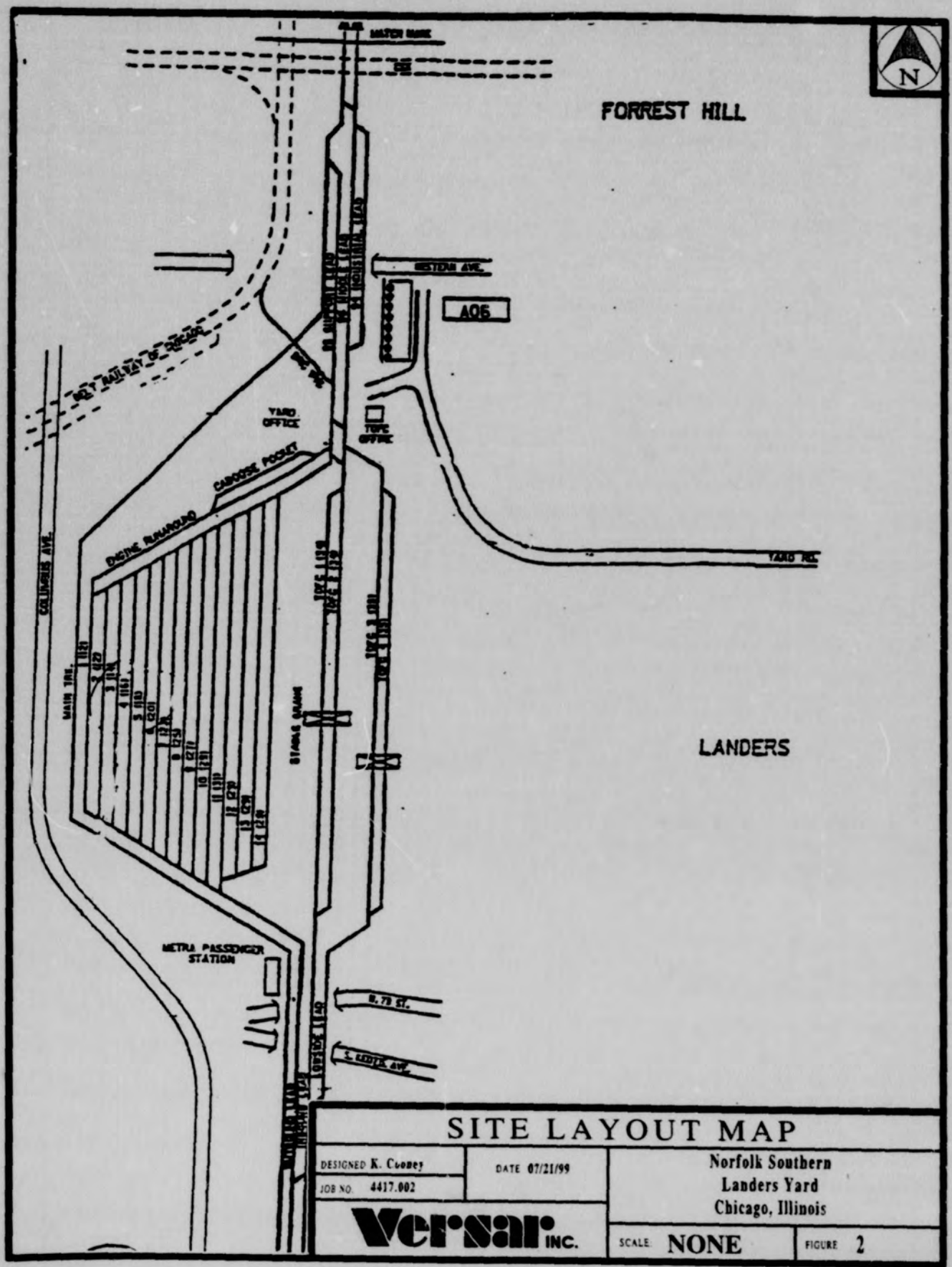
Topography of the Landers Yard facility is characterized by flat land. The USGS 7.5-minute Series maps of the Englewood and Blue Island, Illinois, Quadrangles shows that the elevation of the property is approximately 615 feet above mean sea level. There are no surface waters on the site. The closest surface water to the facility is an unnamed lake at Marquette Park, located approximately 5,000 feet to the north. Surrounding sites also appear to be characterized by flat land, with an elevation of approximately 615 feet in all directions.

Landers Intermodal Facility is located on Rail Line Segment N-499 from Calumet to Landers, Illinois. For the first six months of 1999, an average of 55,309 cars were classified and 3,379 additional cars were transported through this facility each month. In June, 1999, 48,615 cars were classified and 3,677 additional cars were transported through this facility. Rail line segment N-499 is a Key Route. As a result of this acquisition of Conrail, the FEIS concluded that the N-499 rail line segment is not expected to experience a significant increase in hazardous materials transportation.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Landers Intermodal Chicago, Illinois
JOB NO. 4417.002		
Versar INC.	SCALE 1"=24,000'	FIGURE 1


N
FORREST HILL
LANDERS
A05
YARD OFFICE
TOFC OFFICE
CABOOSE POCKET
ENGINE RUNAROUND
COLUMBUS AVE.
METRA PASSENGER STATION
W. 79 ST.
S. LOOMIS AVE.
SITE LAYOUT MAP
DESIGNED K. Cooney
DATE 07/21/99
JOB NO. 4417.002
Versar INC.
Norfolk Southern
Landers Yard
Chicago, Illinois
SCALE NONE
FIGURE 2

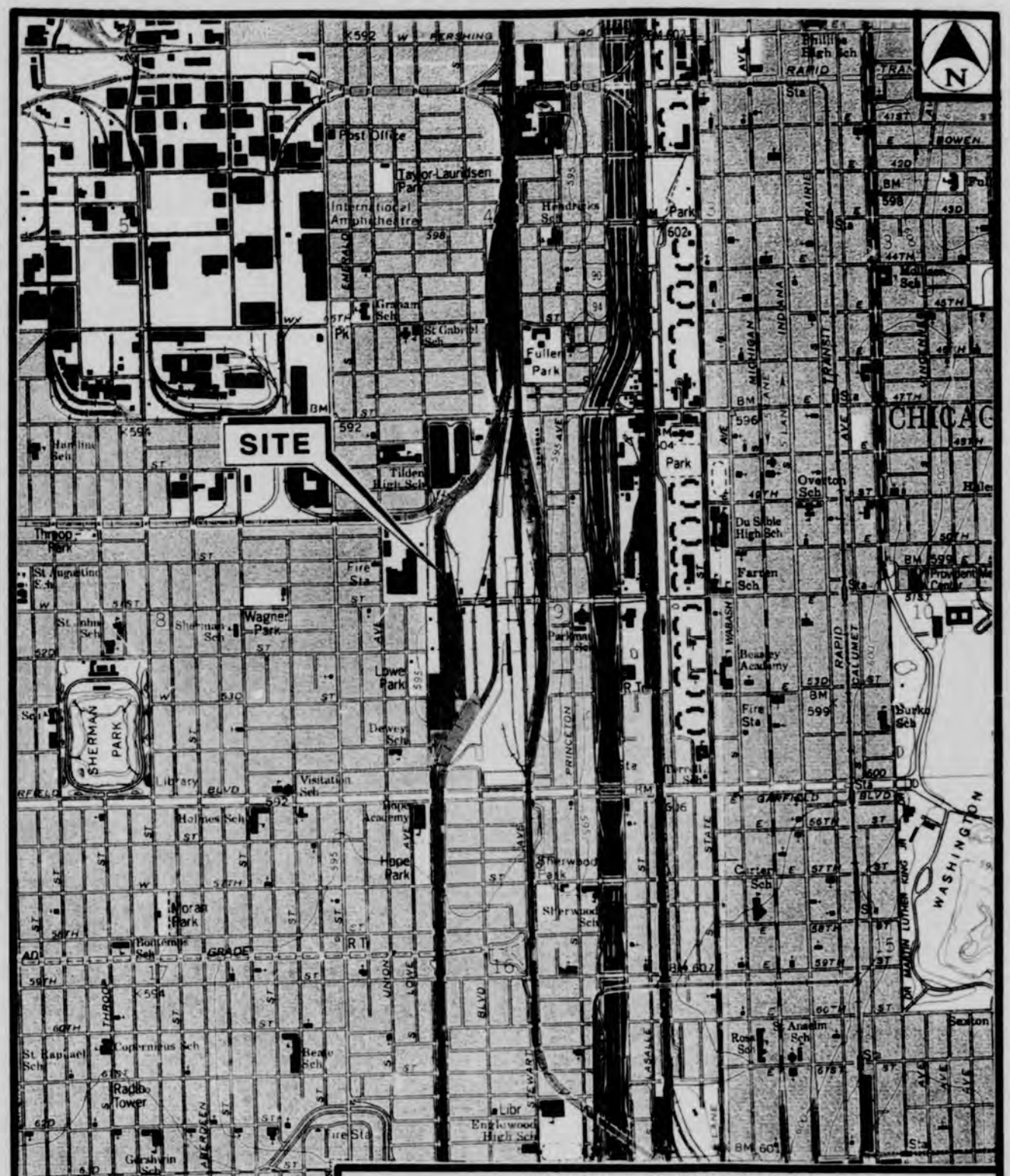
NM03 47TH STREET, CHICAGO, ILLINOIS

47th Street Intermodal Facility is located in southern Chicago, Cook County, Illinois. The facility is located on 47th Street, on a large site east of Halsted Street and west of Interstate 90/94 on the south side of Chicago. The facility operates as an intermodal facility.

The 47th Street facility comprises 68 lines of railroad track. The intermodal facility is located in an urban area. The surrounding population distribution according to the closest US Census Tract indicates there are approximately 1,981 people residing in the area. The average peak number of workers on duty at the facility is 190.

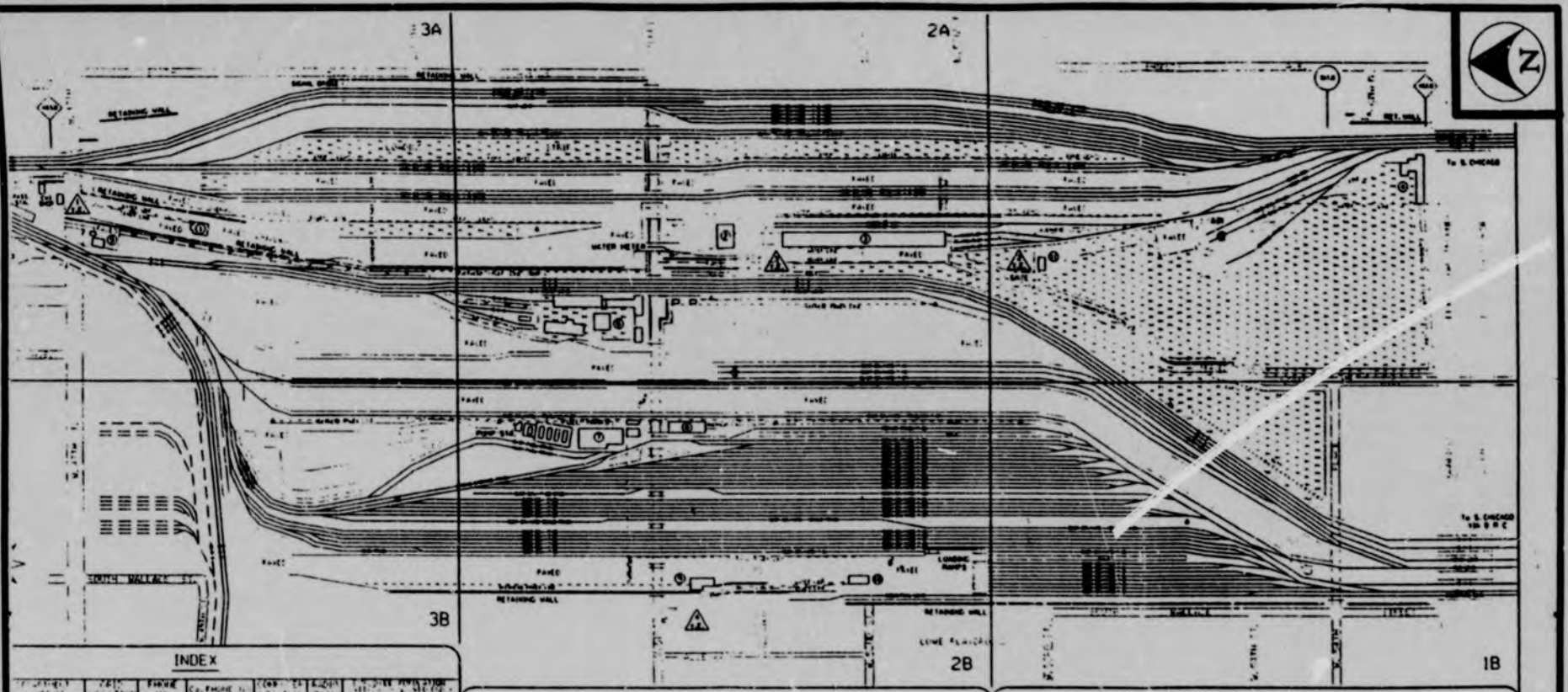
Topography of the 47th Street Yard facility is characterized by flat land. The USGS 7.5-minute Series map of the Englewood, Illinois, Quadrangle shows that the elevation of the property is approximately 595 feet above mean sea level. There are no surface waters on the site. The closest surface water to the facility is lake Michigan, located approximately 3 miles to the east. Surrounding sites also appeared to be characterized by flat land, with an elevation of approximately 595 feet in all directions.

The 47th Street Intermodal Facility is located on Rail Line Segment N-047 from Indiana Harbor, IL to South Chicago, IL. In June, 1999, 10,744 cars were classified and 79 additional cars were transported through this facility. Rail line segment N-047 is currently a Key Route. As a result of this acquisition of Conrail, the FEIS concluded that the N-047 rail line segment is not expected to experience a significant increase in hazardous materials transportation.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	**Norfolk Southern** **47th Street Intermodal** **Chicago, Illinois**
JOB NO 4417.002		
Versar INC.	SCALE **1"=24,000'**	FIGURE **1**



INDEX

	3-A								
	2-A								
	2-A								
	1-A								
	3-A								
	2-A								
	2-B								
	2-B								
	2-B								
	2-B								
	1-A								

LOCATION MAP

LEGEND

FIRE HYDRANT
C/S COMMUNICATIONS
L/C LOW CLEARANCE
WIDTH & OR HEIGHT
IMPROVED ALL WEATHER ROADWAY
REFERENCE NUMBER

NOTES

CONRAIL
CONSOLIDATED RAIL CORPORATION
DEARBORN DIVISION
CHICAGO, IL
47th-51st-55th STREET YARD COMPLEX
INCL. TRAILVAN FACILITIES
EMERGENCY RESPONSE SCHEMATIC
NONE
J.D.S. 11/18/91 CDBN475TF ERH

SITE LAYOUT MAP

DESIGNED Cooney
DATE 07/21/99
JOB NO.

Versar INC.

Norfolk Southern
47th Street Yard
Chicago, Illinois

SCALE NONE
FIGURE 2

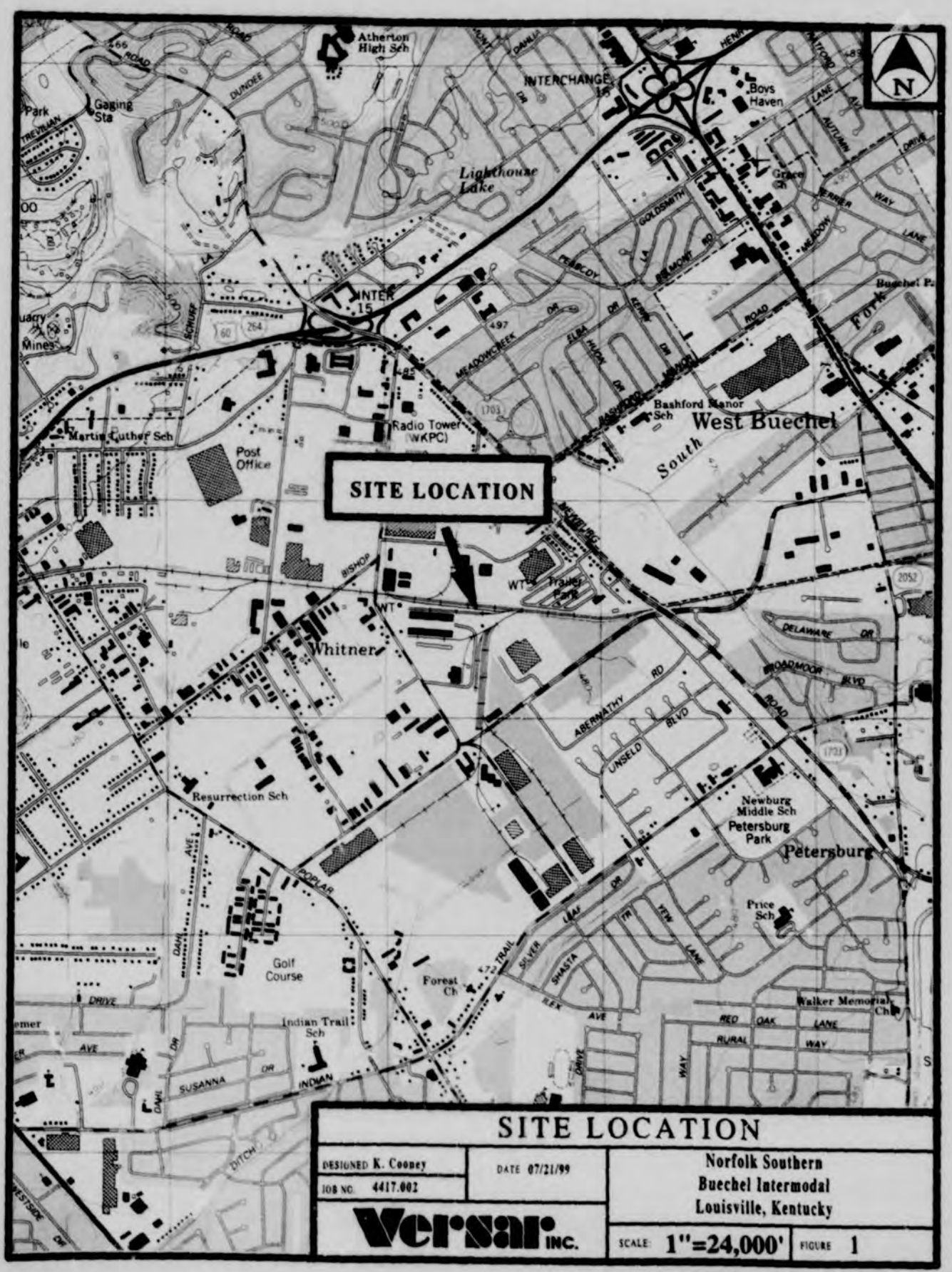
NM04 BUECHEL, LOUISVILLE, KENTUCKY

Buechel Intermodal Facility is located in Louisville, Jefferson County, Kentucky. The facility is located at 3201 Xavier Street. The facility is located in an industrial area southeast of Interstate 264 in the town of Buechel, which is southeast of the city of Louisville. The main gate for truck entry and exit movements is located on Jennings Lane.

The Buechel facility comprises 2 lines of railroad track. The intermodal facility is located in an industrial area. The closest US Census tract indicates there are approximately 2,717 people residing in the area. The average peak number of workers on duty at the facility is 15.

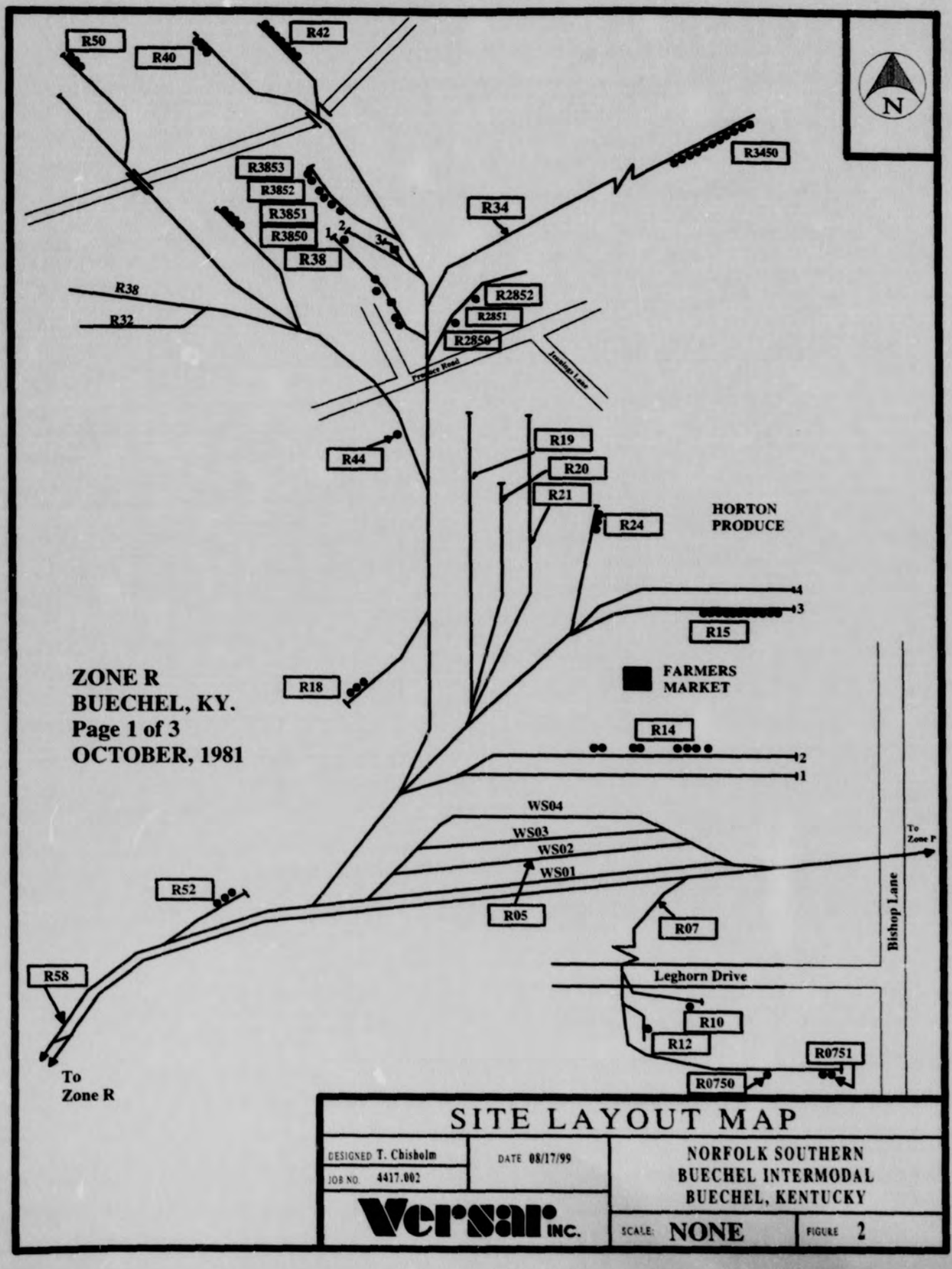
Topography of the Buechel Intermodal facility is characterized by flat land. The USGS 7.5-minute Series map of the Louisville East Kentucky Quadrangle shows that the elevation of the property is approximately 480 feet above mean sea level. There are no surface waters on the facility. The closest surface water to the site is an unnamed creek located approximately 2,000 feet to the northeast. Surrounding sites also appeared to be characterized by flat land, with an elevation of approximately 480 feet in all directions.

The Buechel Intermodal Facility is located on Rail Line Segment N-415 from Louisville, KY to SJ Jct., KY. For the first six months of 1999, an average of 2,350 cars were classified and 32 additional cars were transported through this facility each month. In June, 1999, 2,006 cars were classified and 79 additional cars were transported through this facility. Rail line segment N-415 is currently a Key Route. As a result of this acquisition of Conrail, the FEIS concluded that the N-415 rail line segment is not expected to experience a significant increase in hazardous materials transportation.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Buechel Intermodal Louisville, Kentucky
JOB NO. 4417.002		
Versar INC.	SCALE: 1"=24,000'	FIGURE 1


R50
R40
R42
R3450
R3853
R3852
R3851
R3850
R38
R34
R38
R32
R2852
R2851
R2850
Truelove Road
Jennings Lane
R44
R19
R20
R21
R24
HORTON
PRODUCE
4
3
R15
ZONE R
BUECHEL, KY.
Page 1 of 3
OCTOBER, 1981
R18
FARMERS
MARKET
R14
2
1
WS04
WS03
WS02
WS01
To
Zone P
R52
R05
R07
Bishop Lane
R58
Leghorn Drive
R10
R12
R0751
R0750
To
Zone R
SITE LAYOUT MAP
DESIGNED T. Chisholm
DATE 08/17/99
JOB NO. 4417.002
NORFOLK SOUTHERN
BUECHEL INTERMODAL
BUECHEL, KENTUCKY
Versar INC.
SCALE: NONE
FIGURE 2

NM05 OLIVER, NEW ORLEANS, LOUISIANA

The Oliver Intermodal Facility is located in New Orleans, Orleans Parish, Louisiana. The intermodal facility at Oliver Yard is located on the south side of Florida Avenue in northeastern New Orleans at 2101 St. Ferdinand Street.

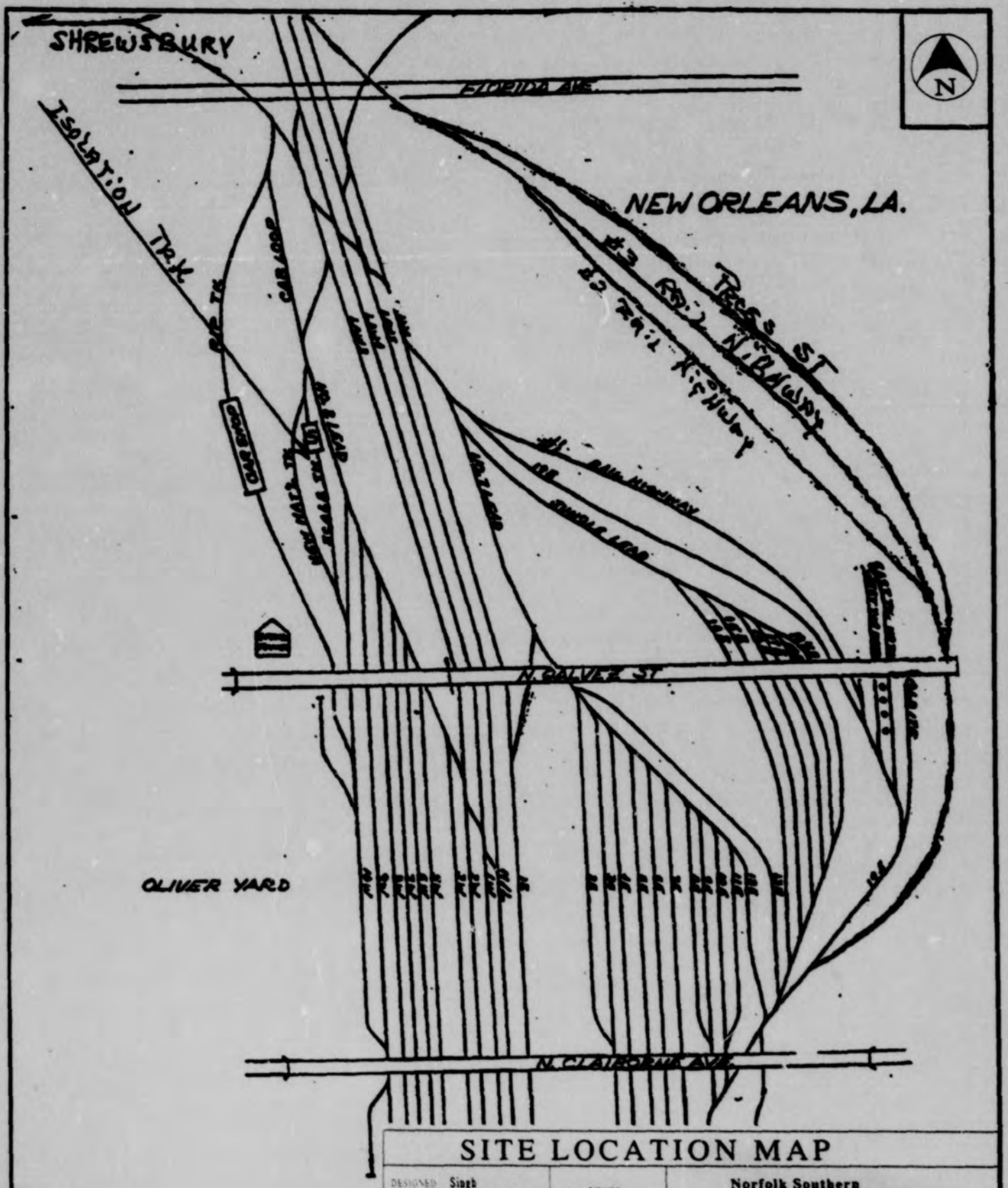
The Oliver facility includes 36 lines of railroad track. The intermodal facility is located in an urban area. The closest US Census rack indicates there are approximately 1,963 people live in the area. The average peak number of workers on duty at the facility is 29.

Topography of the Oliver Yard is characterized by flat land. The USGS 7.5-minute Series map of the New Orleans East, Louisiana, Quadrangle shows that the elevation of the property is below sea level. The facility is located approximately 1 mile north of the Mississippi River. Surrounding sites also appeared to be characterized by flat land, and are also below sea level.

The Oliver Intermodal Facility is located on Rail Line Segment N-346 from Oliver JCT, LA to Oliver Yard, LA. For the first six months of 1999, an average of 7,673 cars were classified and 32 additional cars were transported through this facility each month. In June, 1999, 6,680 cars were classified and 16 additional cars were transported through this facility. Rail line segment N-346 is currently a Key Route. As a result of the acquisition of Conrail, the FEIS concluded that the N-346 rail line segment is not expected to experience a significant increase in hazardous materials transportation.

SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Oliver Intermodal New Orleans, Louisiana
JOB NO. 4417.002		
Versar INC.	SCALE 1"=24,000'	FIGURE 1



SITE LOCATION MAP

DESIGNED: Singh	DATE: 7/26/99	Norfolk Southern Oliver Yard New Orleans, Louisiana	
JOB NO: 4417.002			
Versar INC.		SCALE: NONE	FIGURE 2

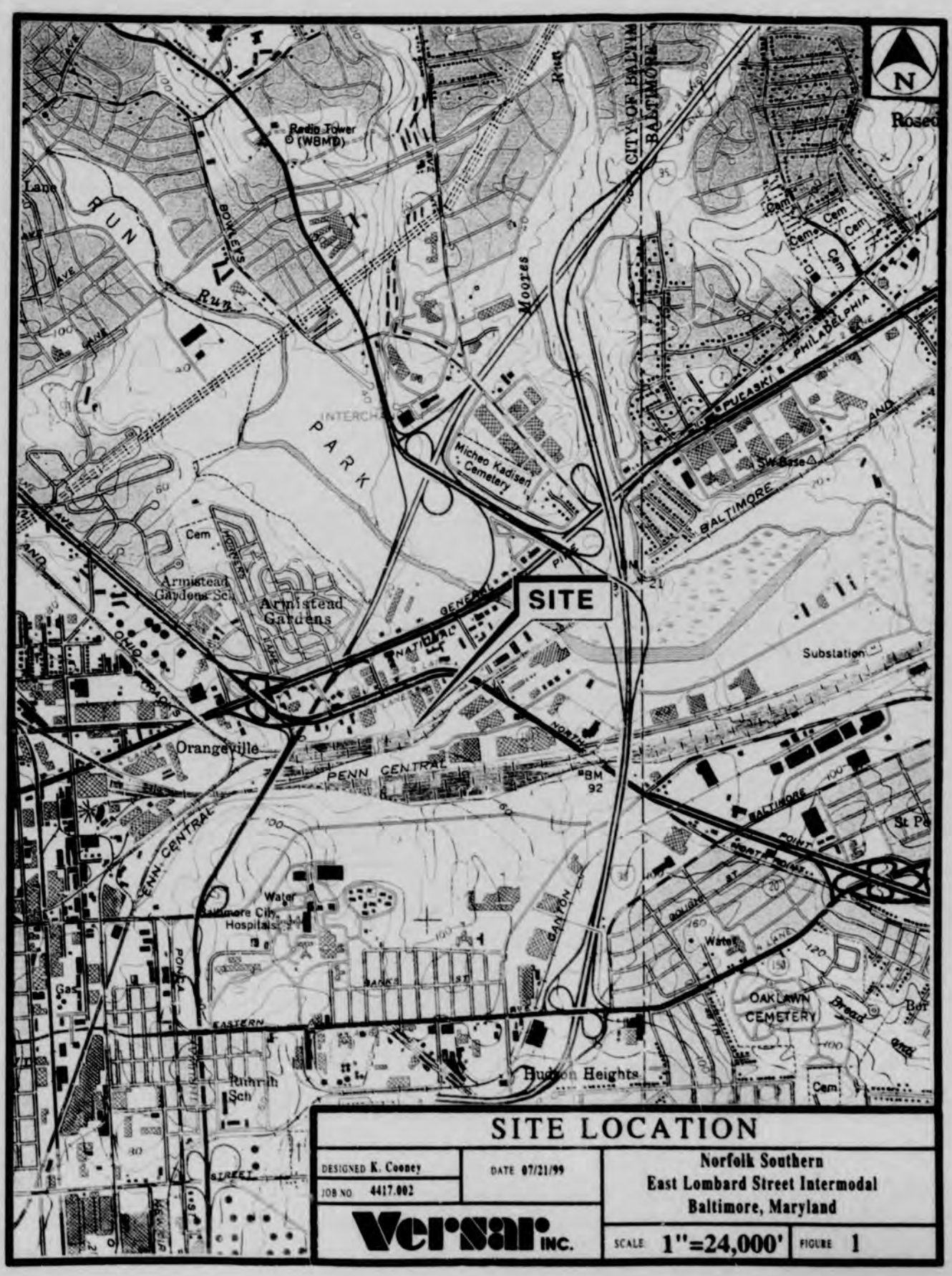
NM06 EAST LOMBARD STREET, BALTIMORE, MARYLAND

The East Lombard Street Intermodal Facility is located in Baltimore, Baltimore County, Maryland at 6000 East Lombard Street.

The East Lombard Street facility includes 37 lines of railroad track. The intermodal facility is located in an urban/industrial area. The closest US Census tract indicates approximately 2,123 people reside in the area. The average peak number of workers on duty at the facility is 50.

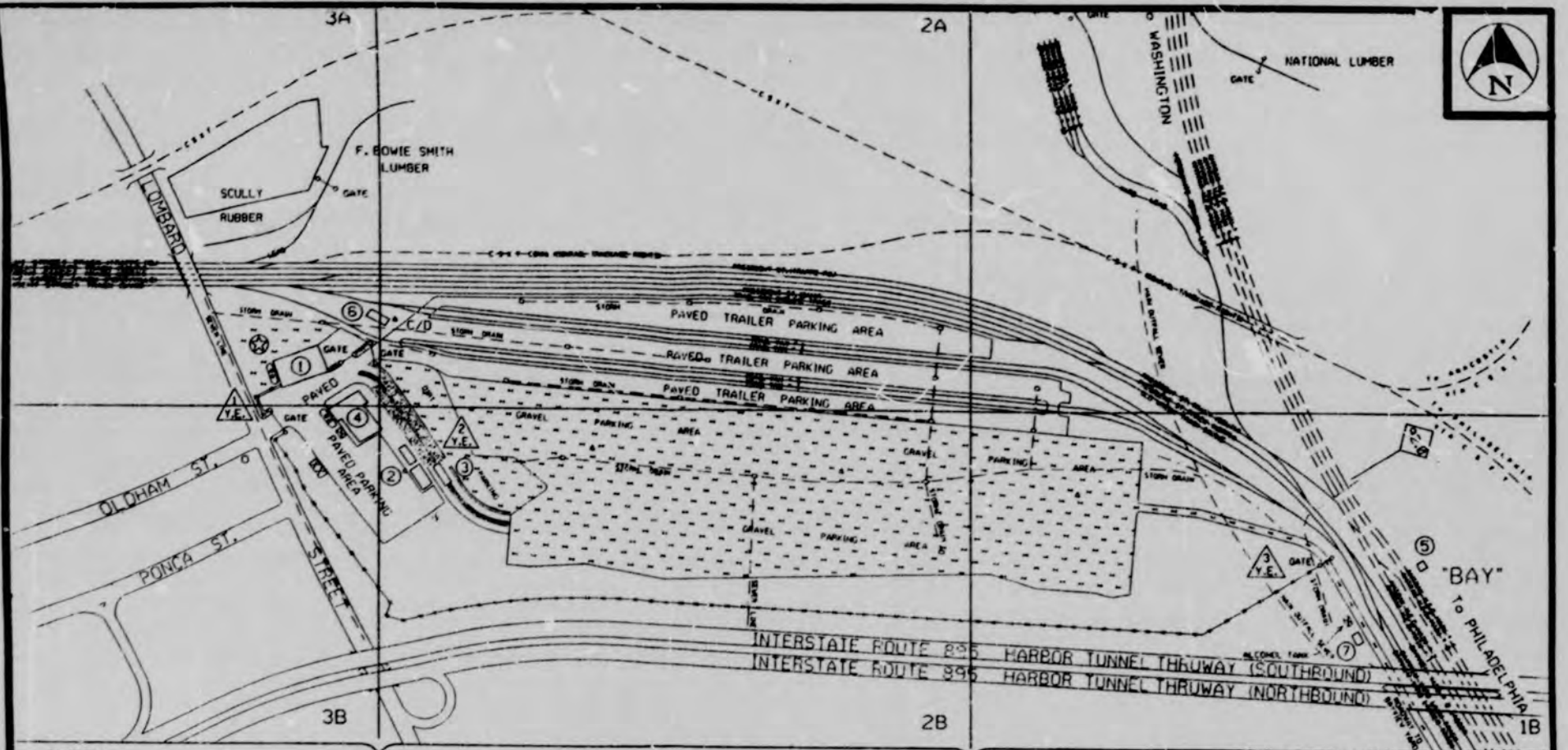
Topography of the East Lombard Street Intermodal is characterized by flat land. The USGS 7.5-minute Series map of the Baltimore East, Maryland, Quadrangle shows that the elevation of the property is approximately 60 feet above mean sea level. An unnamed creek bounds the facility to the northeast. Surrounding sites also appeared to be characterized by flat land, with an elevation of approximately 60 feet above msl to the north, south, and west, and 80 feet above msl to the east.

The East Lombard Street Intermodal Facility is located on rail line segment S-238 from Perryville to Baltimore, MD. In June, 1999, 10,418 cars were classified and 661 additional cars were transported through this facility. Rail line segment S-238 is currently not a Key Route and is not projected to become a new Key Route or a new Major Key Route. As a result of the acquisition of Conrail, the FEIS concluded that the rail line segment is not expected to experience a significant increase in hazardous materials transportation.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern East Lombard Street Intermodal Baltimore, Maryland
JOB NO 4417.002		
Versar INC.	SCALE 1"=24,000'	FIGURE 1



B-18

INDEX

House No.	Co. Phone No.	Computer Location	Radio Base	Employee Population Weekday 1	2	3	Weekend 1	2	3
	8-323-1547			2	1	1	1	0	0
	8-323-1511	X		7	6	0	3	0	4
	8-323-1529	X		4	2	1	1	0	1
	8-323-1511			5	0	0	0	0	0
			X	1	1	1	1	1	1
	8-323-1566		X	1	1	0	1	0	0
				6	0	0	0	0	0

LOCATION MAP

LEGEND

- AIR TANKS
- GUARD RAIL
- STORM DRAIN W/INLET-SEWER LINE
- C/D CAR DEPARTMENT
- NON-IMPROVED (GRAVEL) ROADWAY
- FENCE
- 1A GRID NUMBER
- DESIRED LOCATIONS TO TRANSPORT HAZ. MAT. CARS NEEDING REPAIR
- PROPANE TANKS
- GASOLINE TANKS
- FUEL OIL TANKS
- OXYGEN & ACETYLENE
- FIRE HYDRANT
- C/S COMMUNICATIONS & SIG
- L/C LOW CLEARANCE (WIDTH &/OR HEIGHT)
- IMPROVED (BLACKTOP) ROADWAY
- BLDG. REF. NUMBER
- YARD ENTRANCE

CONRAIL HARRISBURG DIVISION
CONSOLIDATED RAIL CORPORATION

SITE LAYOUT MAP

Designer: S Blair	Date: 07/26/99	Norfolk Southern E. Lombard St. Yard Baltimore, Maryland
Job No:		
Versar INC.	Scale: NONE	Figure: 2

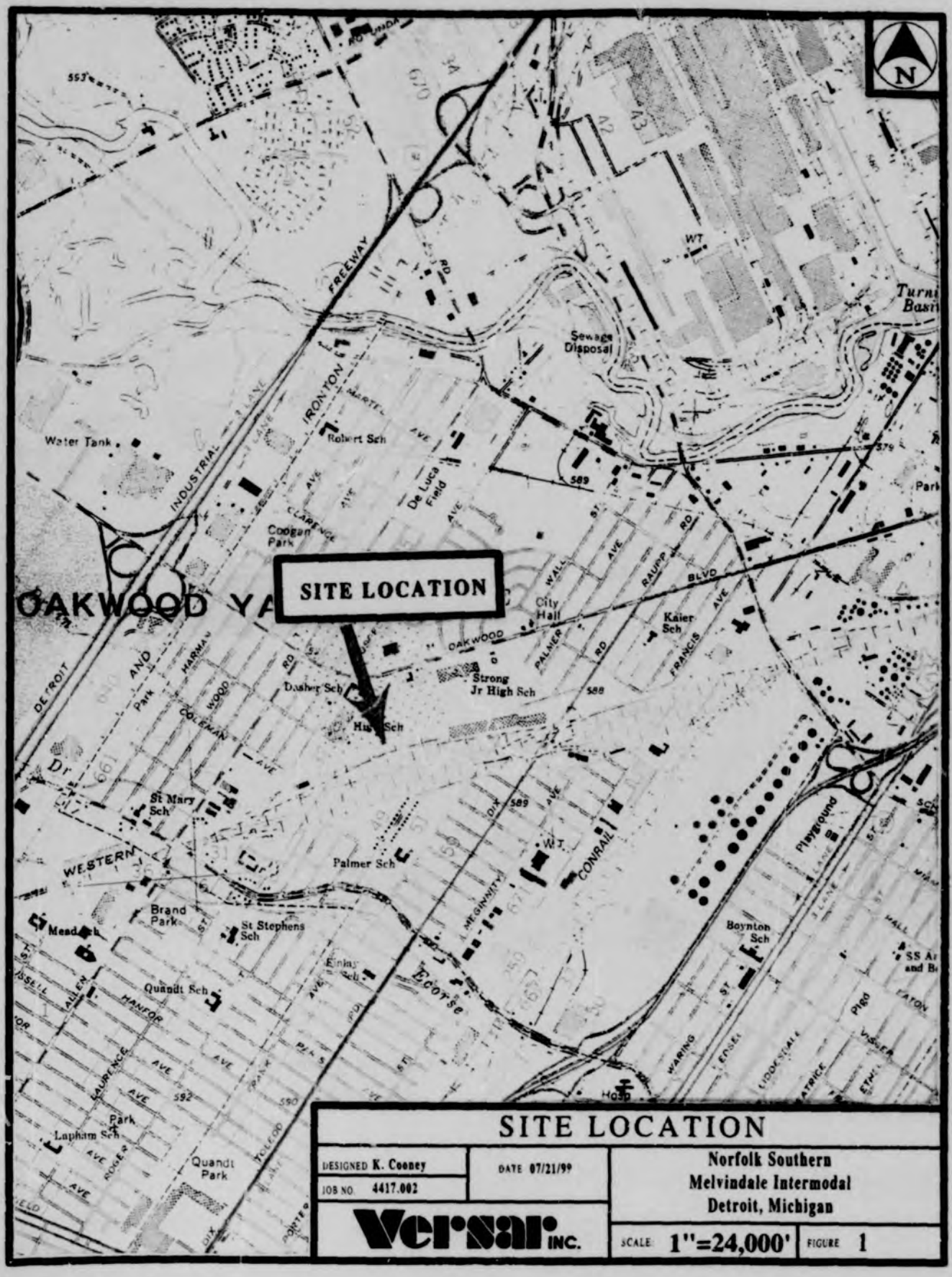
NM07 MELVINDALE, WAYNE, MICHIGAN

The Melvindale Intermodal Facility is located in Detroit, Wayne County, Michigan at 19400 Prospect Street. The facility is located at Oakwood Yard in the City of Melvindale, southeast of downtown Detroit. The conventional intermodal facility and the Triple Crown Service facility are located on the same site, however there are separate entrances for each as the facilities are operated independently.

The Melvindale facility consists of approximately 64 tracks with a 2,850 car capacity used for interchange deliveries and to make up road trains, local trains and store cars. The intermodal facility is located in a residential area. The closest US Census tract indicates approximately 5,986 people reside in the area. The average peak number of workers on duty at the Melvindale facility is 35.

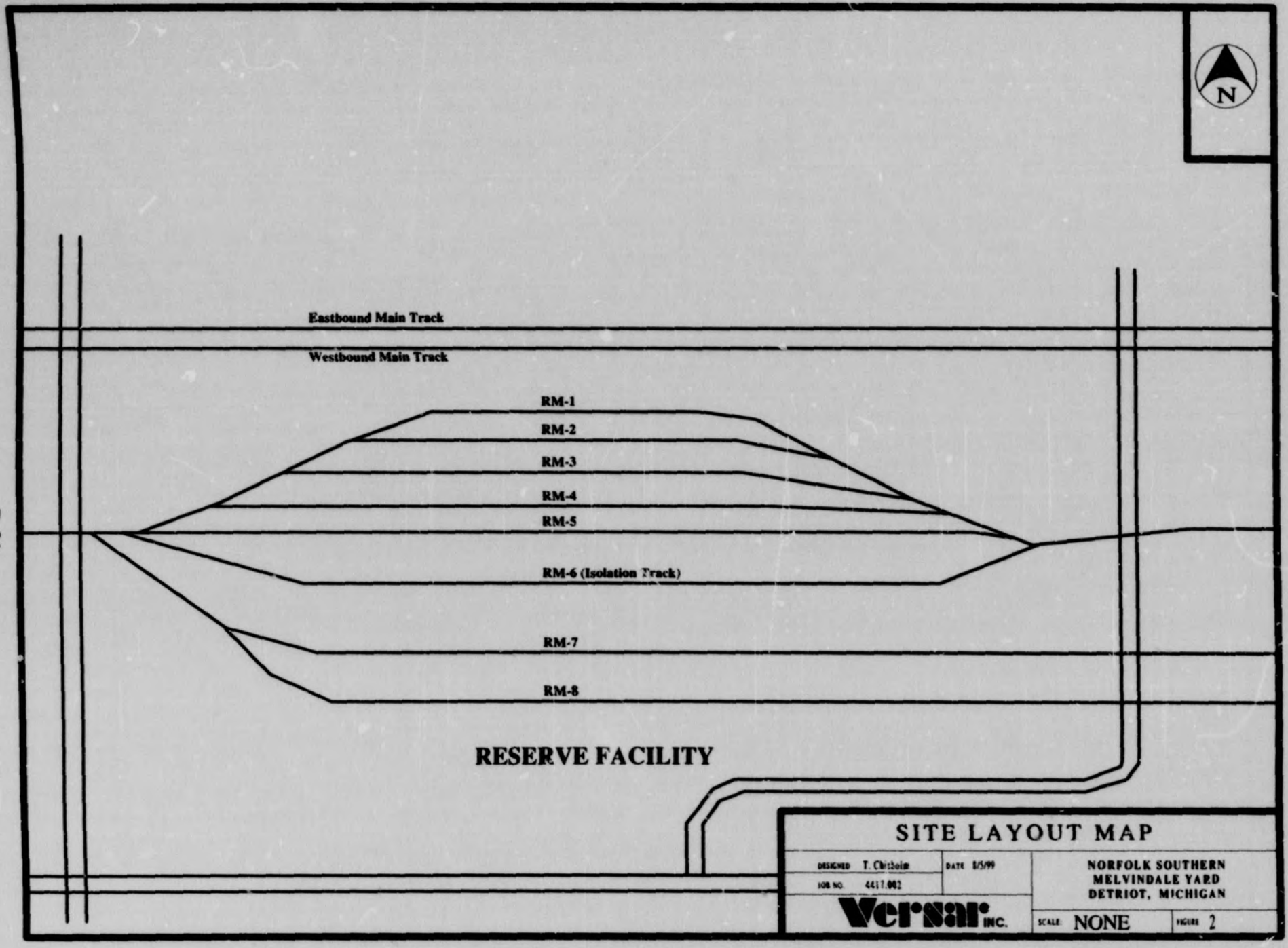
Topography of the Melvindale Facility is characterized by flat land. The USGS 7.5-minute Series map of the Dearborn, Michigan, Quadrangle shows that the elevation of the property is approximately 585 feet above mean sea level. There are no surface waters on the site. The closest surface water is the Rouge River, which is located approximately 1 mile to the north. Surrounding sites also appeared to be characterized by flat land, with an elevation of approximately 585 feet to the north, east, and west, and 590 feet above msl to the south.

The Melvindale Intermodal Facility is located on Rail Line Segment N-475 from Oakwood, MI to Butler, IN. For the first six months of 1999, an average of 36,902 cars were classified and 7,865 additional cars were transported through this facility each month. In June, 1999, 36,989 cars were classified and 8,144 additional cars were transported through this facility. Rail line segment N-475 is currently not a Key Route and is not projected to become a new Key Route or a new Major Key Route. As a result of the acquisition of Conrail the FEIS concluded that the N-475 line segment is not expected to experience a significant increase in hazardous materials transportation.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Melvindale Intermodal Detroit, Michigan
JOB NO. 4417.002		
Versar INC.	SCALE 1"=24,000'	FIGURE 1


N
Eastbound Main Track
Westbound Main Track
RM-1
RM-2
RM-3
RM-4
RM-5
RM-6 (Isolation Track)
RM-7
RM-8
RESERVE FACILITY
SITE LAYOUT MAP
DESIGNED T. Chisholm
DATE 8/5/99
JOB NO. 4417.002
Versar INC.
NORFOLK SOUTHERN
MELVINDALE YARD
DETRIOT, MICHIGAN
SCALE NONE
FIGURE 2

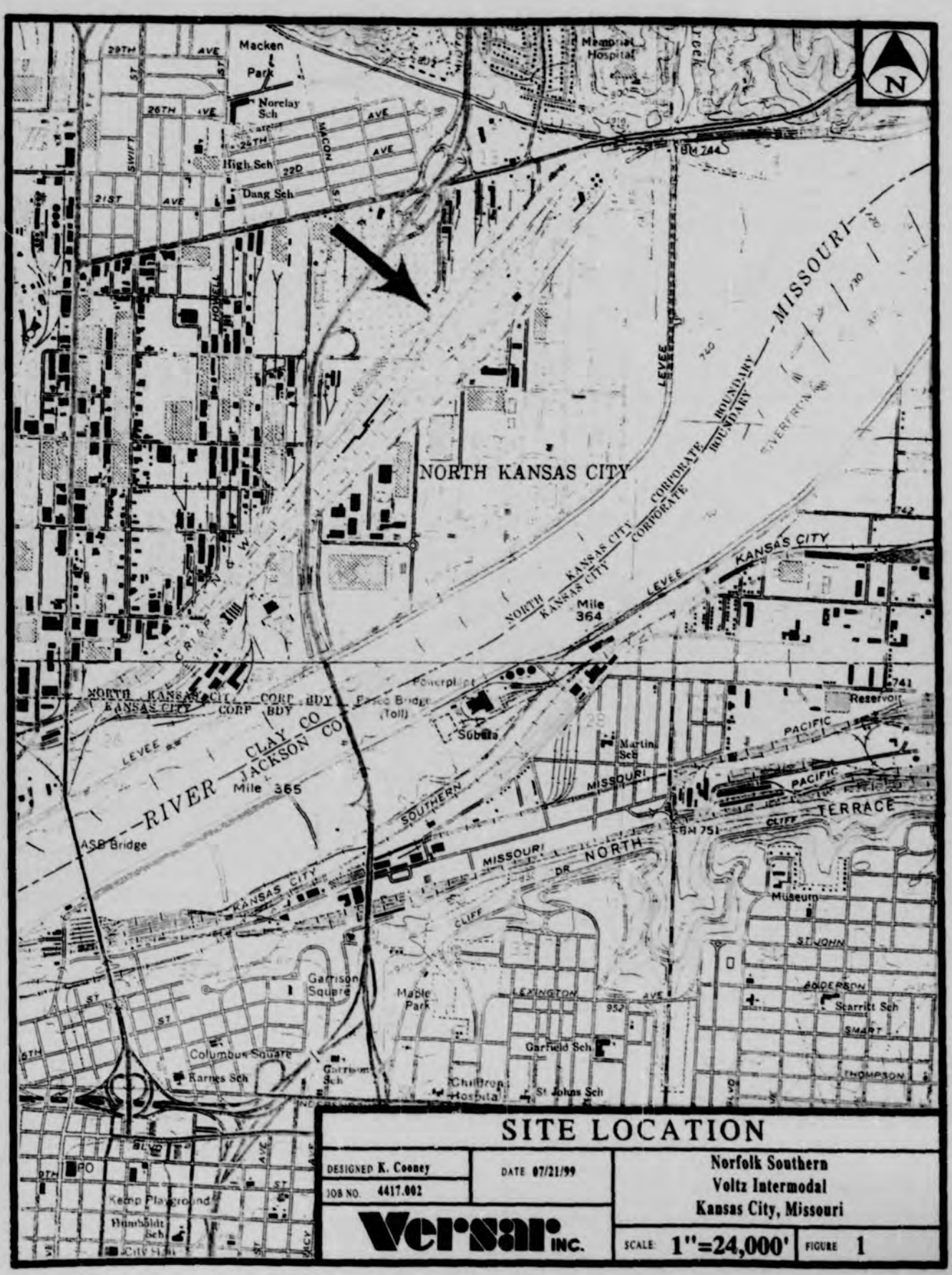
NM08 VOLTZ, KANSAS CITY, MISSOURI

The Voltz Intermodal Facility is located in Kansas City, Clay County, Missouri at 1130 Bedford Avenue. The facility operates as a general switching facility receiving inbound cars from through freighter trains and foreign railroads.

The Voltz facility comprises 71 lines of railroad track. The intermodal facility is located in an urban area. The closest US Census tract indicates that approximately 183 people reside in the area. The average peak number of workers on duty at the facility is 33.

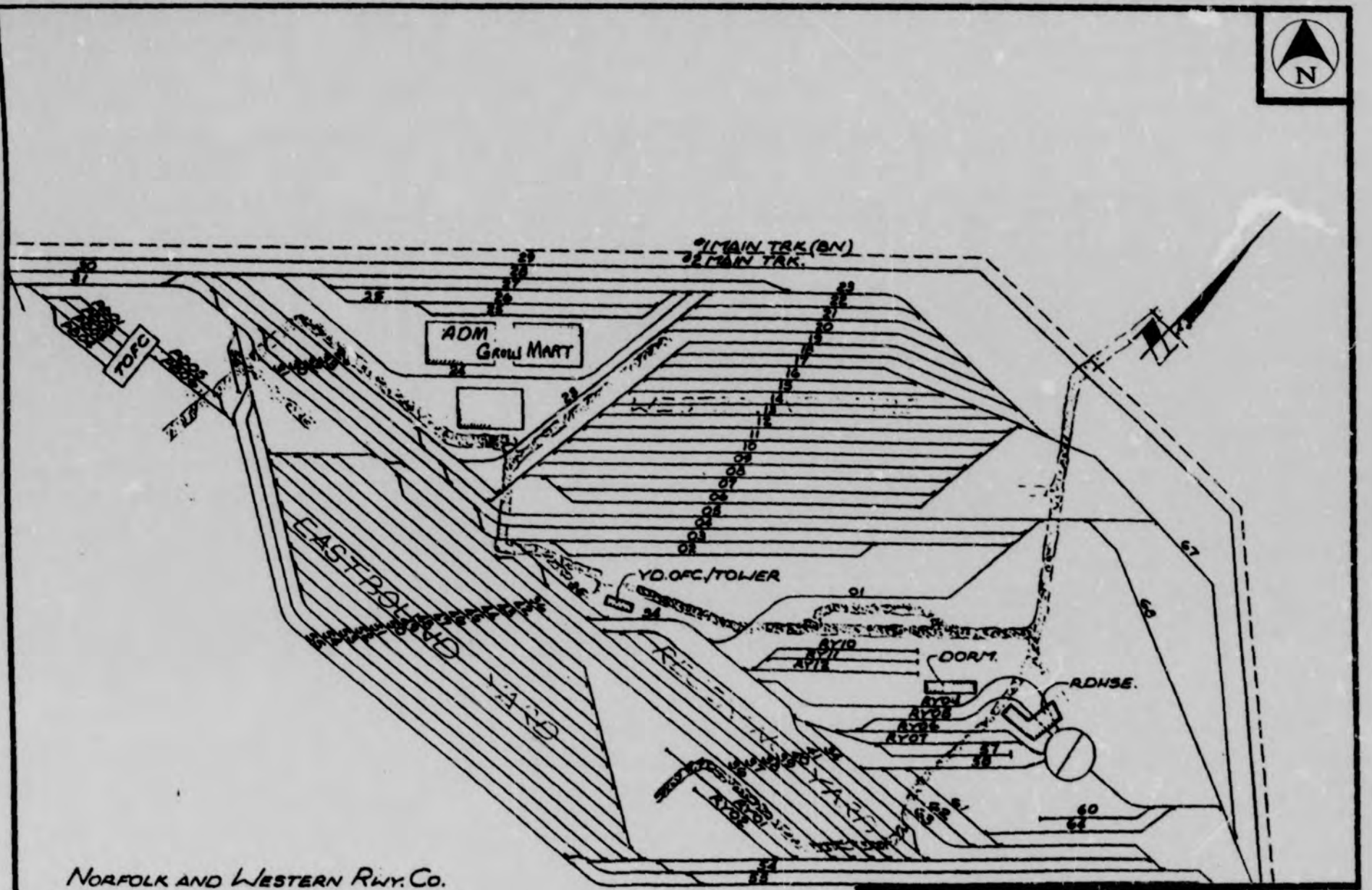
Topography of the Voltz Facility is characterized by flat land. The USGS 7.5-minute Series map of the North Kansas City, Missouri-Kansas, Quadrangle shows that the elevation of the property is approximately 740 feet above mean sea level. There are no surface waters on the site. The closest surface water is the Missouri River, which is located approximately 3,000 feet to the southeast. Surrounding sites also appeared to be characterized by flat land, with an elevation of approximately 740 feet in all directions.

The Voltz Intermodal Facility is located on Rail Line Segment N-479 from CA JCT, MO to North Kansas City, MO. For the first six months of 1999, an average of 43,321 cars were classified and 3,007 additional cars were transported through this facility each month. In June, 1999, 43,670 cars were classified and 2,877 additional cars were transported through this facility. Rail line segment N-479 is currently not a Key Route and is not projected to become a new Key Route or a new Major Key Route. As a result of the acquisition of Conrail, the FEIS concluded that the N-479 segment is not expected to experience a significant increase in hazardous materials transportation.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Voltz Intermodal Kansas City, Missouri
JOB NO. 4417.002		
Versar INC.	SCALE 1"=24,000'	FIGURE 1


N
MAIN TRK (ON)
MAIN TRK.
ADM
GRAIN MART
TOFC
EASTBOUND YARD
YD. OFC./TOWER
RDHSE.
NORFOLK AND WESTERN RWY. CO.
SCHEMATIC DIAGRAM
NORTH KANSAS CITY YARD
SITE LAYOUT MAP
S. Blair
07/06/99
Norfolk Southern
Voltz Yard
Kansas City, Missouri
Versar INC.
NONE
2

NM09 LUTHER INTERMODAL, ST. LOUIS, MISSOURI

The Missouri Luther Intermodal Facility is located in St. Louis, St. Louis County, Missouri at 7021 Hall Street in the northern portion of St. Louis.

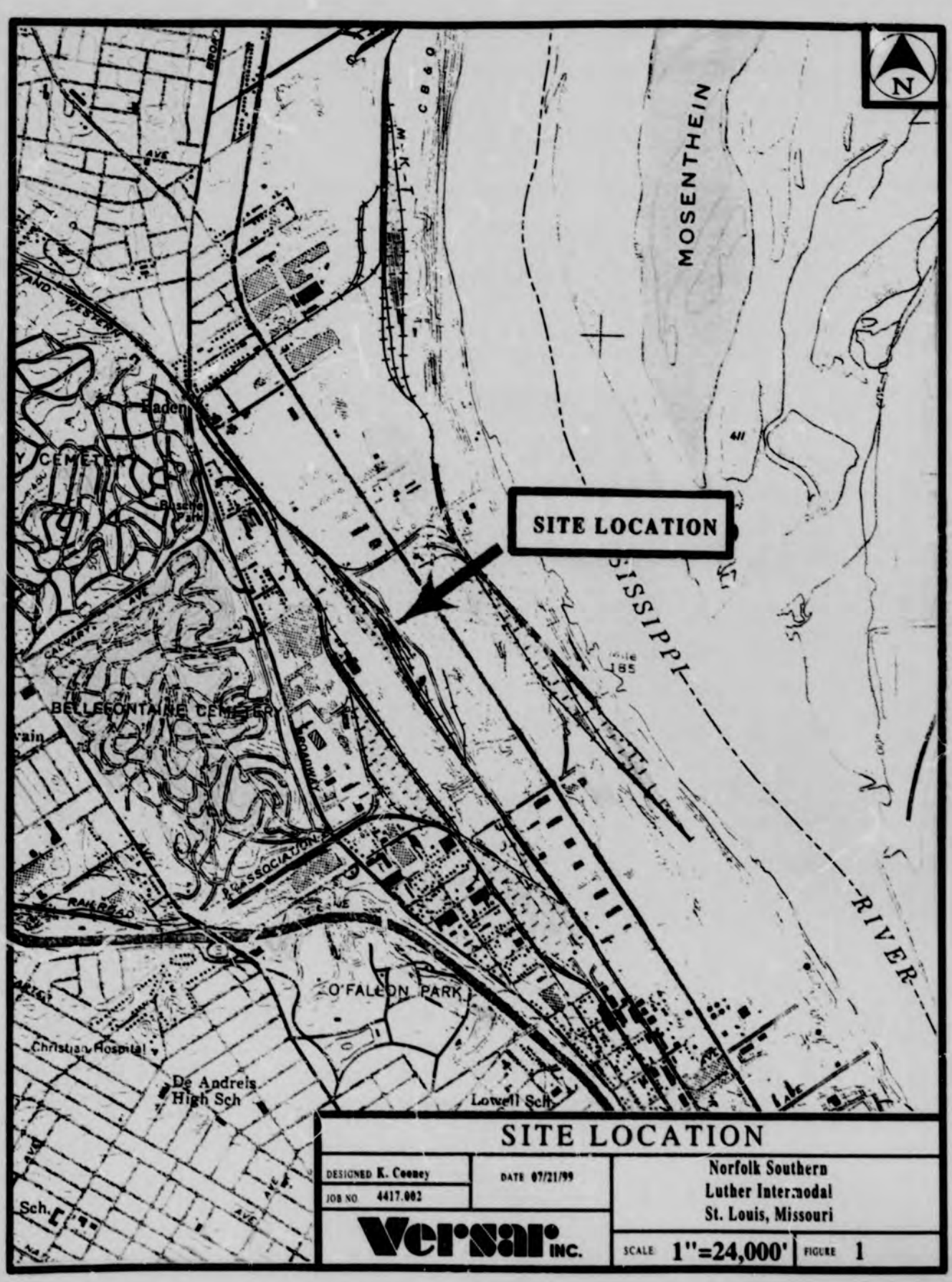
The Luther facility comprises 38 lines of railroad track. The intermodal facility is located in an urban/industrial area. The closest US Census tract indicates there are approximately 1,204 people living in the area. The average peak number of workers on duty at the facility is 24.

Topography of the Luther Intermodal is characterized by flat land. The USGS 7.5-minute Series map of the Granite City, Missouri-Illinois, Quadrangle shows that the elevation of the property is approximately 450 feet above mean sea level. There are no surface waters on the site. The closest surface water to the yard is the Mississippi River, which is approximately 3,000 feet to the east. Surrounding sites also appeared to be characterized by flat land, with elevations of approximately 450 feet in all directions.

The Luther Intermodal Facility is located on Rail Line Segments:

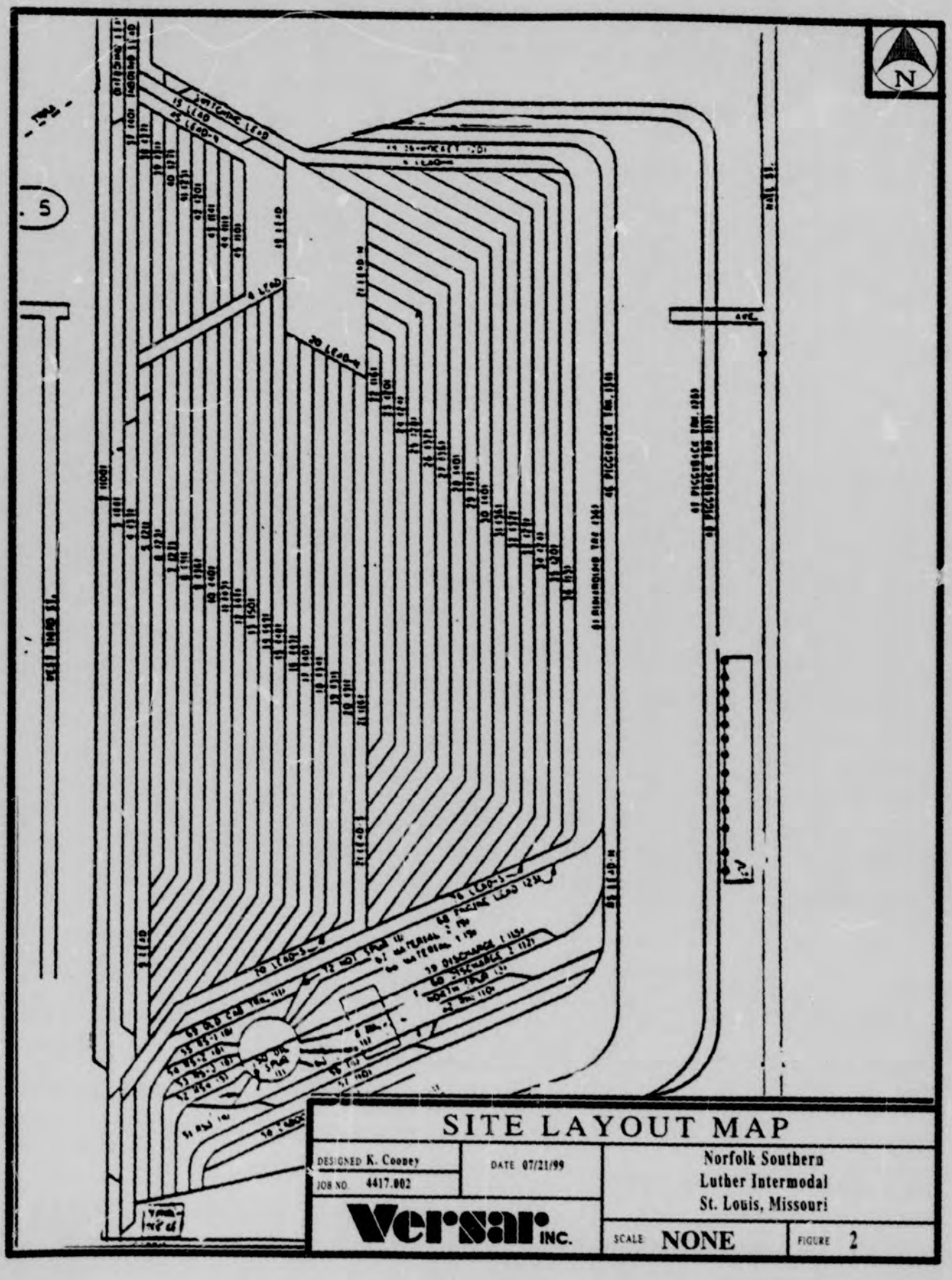
- N-494 from East St. Louis, IL to Luther, MO
- N-495 from Luther, MO to Moberly, MO

For the first six months of 1999, an average of 42,039 cars were classified and 9,420 additional cars were transported through this facility each month. In June, 1999, 51,549 cars were classified and 10,055 additional cars were transported through this facility. Rail line segments N-494 and N-495 are currently not Key Routes and are not projected to become new Key Routes or new Major Key Routes. As a result of the acquisition of Conrail, the FEIS concluded that these rail line segments are not expected to experience a significant increase in hazardous materials transportation.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Luther Intermodal St. Louis, Missouri
JOB NO 4417.002		
Versar INC.	SCALE 1"=24,000'	FIGURE 1


N
SITE LAYOUT MAP
DESIGNED K. Cooney
DATE 07/21/99
JOB NO 4417.002
Versar INC.
Norfolk Southern
Luther Intermodal
St. Louis, Missouri
SCALE NONE
FIGURE 2

NM10 E-RAIL, ELIZABETH, NEW JERSEY

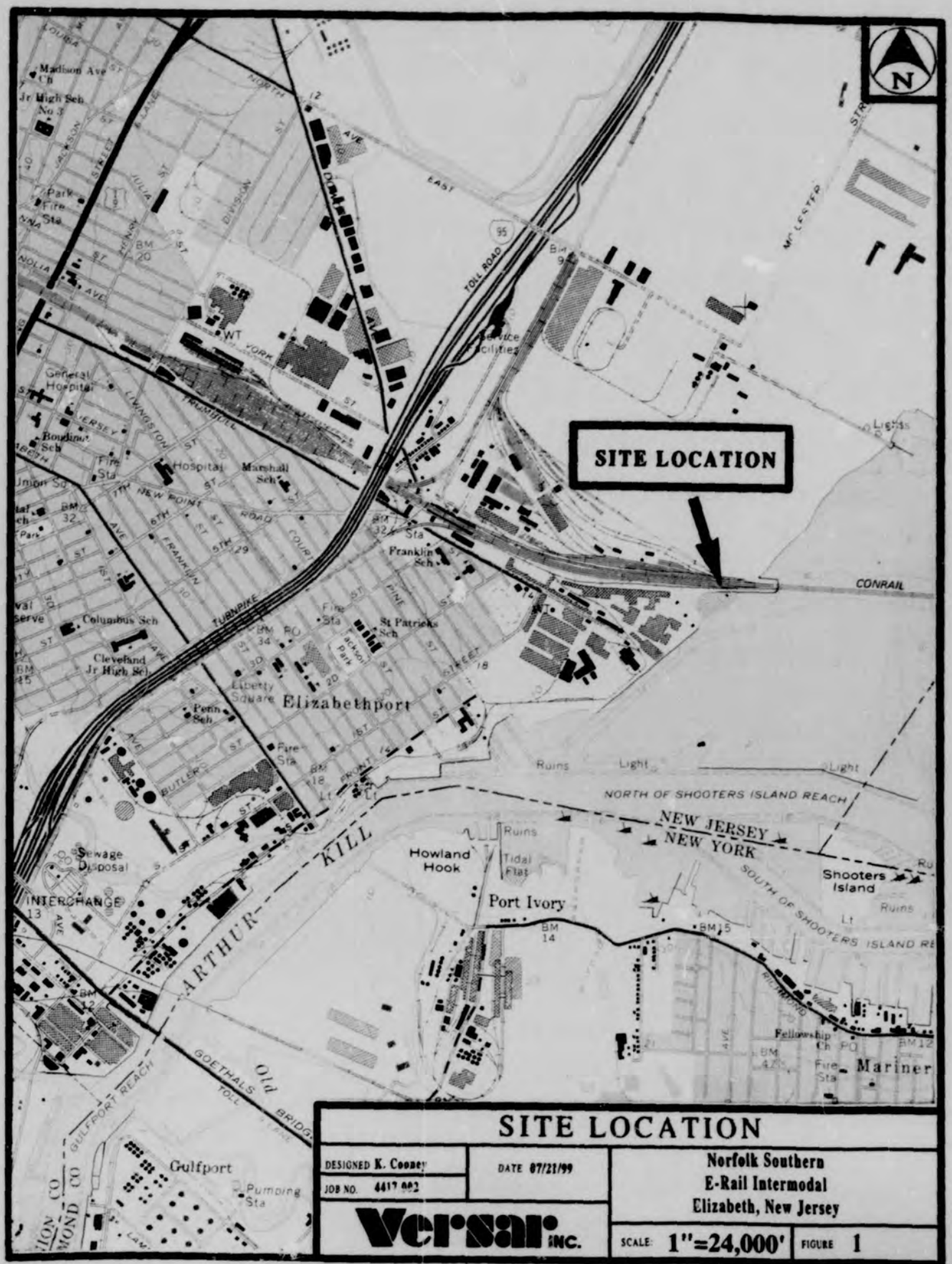
The E-Rail Intermodal Facility is located in Elizabeth, Union County, New Jersey at 322 3rd Street. The facility operates as a general switching facility receiving inbound cars from through freight trains.

The E-Rail facility comprises 7 lines of railroad track. The intermodal facility is located in an urban/industrial area. The closest US Census tract indicates that approximately 166 people reside in the area. The average number of workers on duty at the facility is 100.

Topography of the E-Rail Intermodal Terminal is characterized by flat land. The USGS 7.5-minute Series map of the Elizabeth, New Jersey-New York, Quadrangle shows that the elevation of the property is approximately 10 feet above mean sea level. The Newark Bay bounds the facility to the east. Surrounding sites also appeared to be characterized by flat land, with an elevation of approximately 10 feet to the north, south, and west.

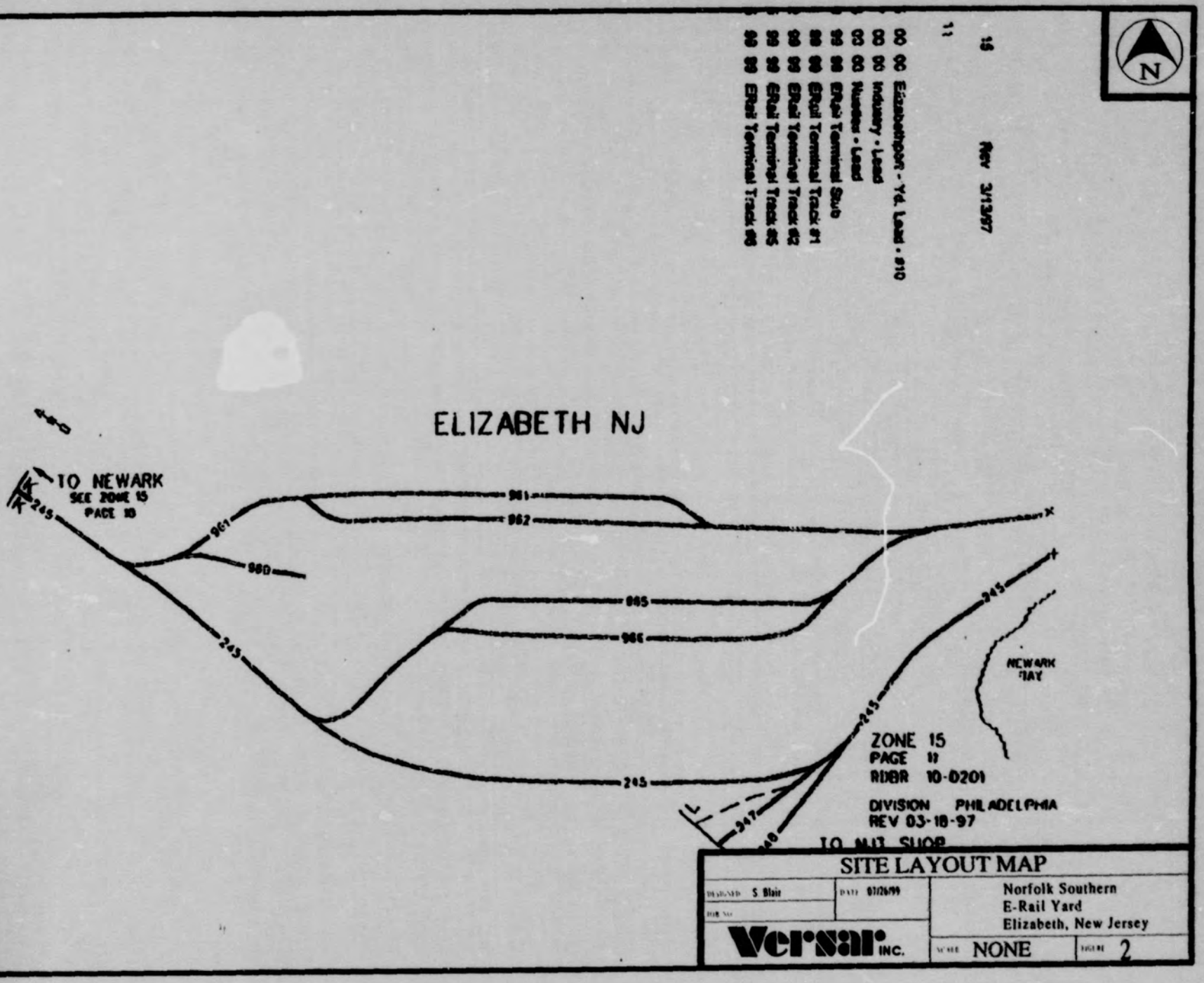
The E-Rail Intermodal Facility is located on Rail Line Segment N-209 from Oak Island to E-Rail, NJ. The FEIS reports the number of trucks handled per day is going to increase from 72 to 407 trucks per day.

On NS, E-Rail Intermodal is included as part of line-of-road operations. Car accounting does not track monthly car classifications at this facility. Line segment N-209 is currently a Key Route. As a result of the acquisition of Conrail, the FEIS concluded that the N-209 rail line segment is not expected to experience a significant increase in hazardous material transportation.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern E-Rail Intermodal Elizabeth, New Jersey
JOB NO. 4417.002		
Versar INC.	SCALE 1"=24,000'	FIGURE 1


ELIZABETH NJ
TO NEWARK
SEE ZONE 15
PAGE 10
961
962
980
965
966
245
NEWARK BAY
ZONE 15
PAGE 11
RIDER 10-0201
DIVISION PHILADELPHIA
REV 03-18-97
TO MJ SHOP
SITE LAYOUT MAP
S Blair
01/26/99
Norfolk Southern
E-Rail Yard
Elizabeth, New Jersey
Versar INC.
NONE
2

NM11 SANDUSKY INTERMODAL, OHIO

The new Sandusky Intermodal Facility is located along the east side of the existing NS rail yard approximately 2 miles southwest of downtown Sandusky, Ohio at 3811 Old Railroad Road in Sandusky, Ohio.

Construction of the facility was completed on April 12, 1999. The facility operates as a Triple Crown Service (TCS) facility. The main gate for the facility is located on Old Railroad Road, south of Perkins Avenue.

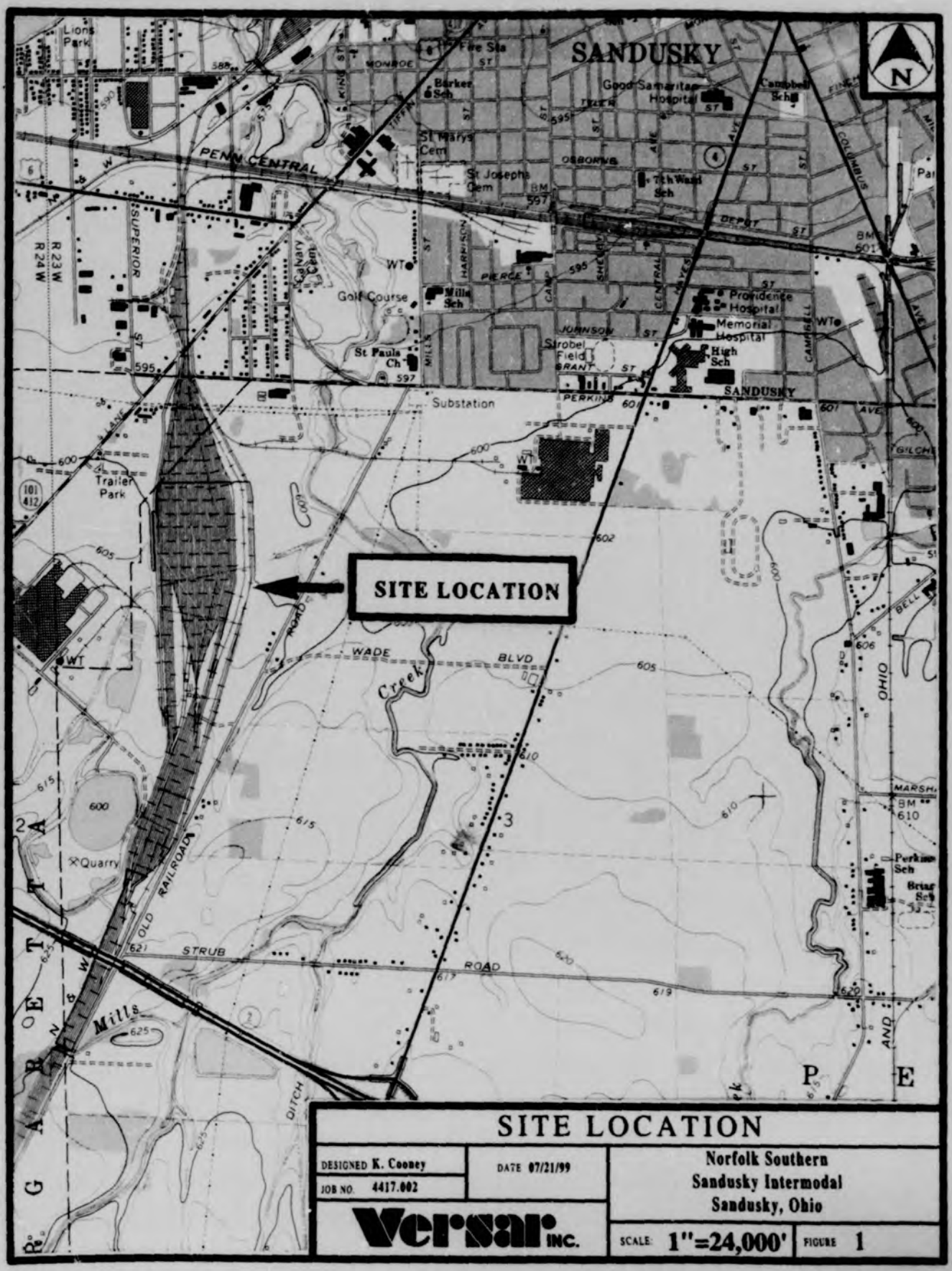
The Sandusky facility comprises 3 lines of railroad track and 150 trailer parking spaces. The intermodal facility is located in an industrial area. The closest US Census tract indicates that approximately 4,781 people reside in the area. The average peak number of workers on duty at the facility is 8 shift workers and 20 truck drivers.

Topography of the Sandusky Intermodal facility is characterized by flat land as indicated on the USGS 7.5-minute series map of the Sandusky, Ohio, Quadrangle. The elevation of the facility is approximately 605 feet above mean sea level. Several unnamed ponds are located to the west of the facility. Adjacent property elevations ranged from approximately 605 feet to the north, south, and 600 feet to the east and west.

The Sandusky Intermodal Facility is located on NS Rail Line Segments:

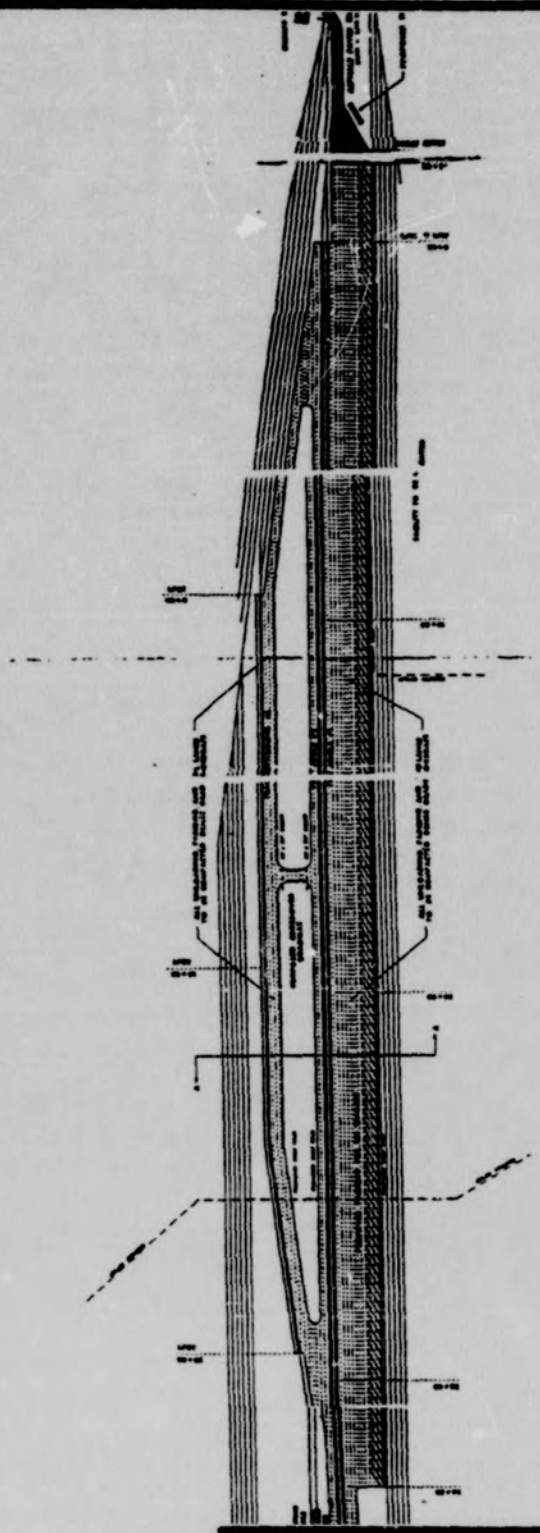
- N-085 from Beltsville to Sandusky Docks, OH
- N-294 from Vermilion to Oak Harbor, OH

For the first six months of 1999, an average of 10,955 cars were classified and 1,975 additional cars were transported through this facility each month. In June, 1999, 17,726 cars were classified and 3,798 additional cars were transported through this facility. Rail line segment N-294 is currently a Key Route. As a result of the acquisition of Conrail, the FEIS concluded that the two rail line segments are not expected to experience a significant increase in hazardous material transportation.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Sandusky Intermodal Sandusky, Ohio
JOB NO. 4417.002		
Versar INC.	SCALE: 1"=24,000'	FIGURE 1



SITE LAYOUT MAP

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Sandusky Yard Sandusky, Ohio
JOB NO. 4417.002		
Versar INC.	SCALE: NONE	FIGURE 2

NM12 DISCOVERY PARK, COLUMBUS, OHIO

The Discovery Park Intermodal Facility is located in Columbus, Franklin County, Ohio at 1855 Watkins Road, Columbus, Ohio 43207. The facility operates as a general switching facility receiving inbound cars from through freighter trains.

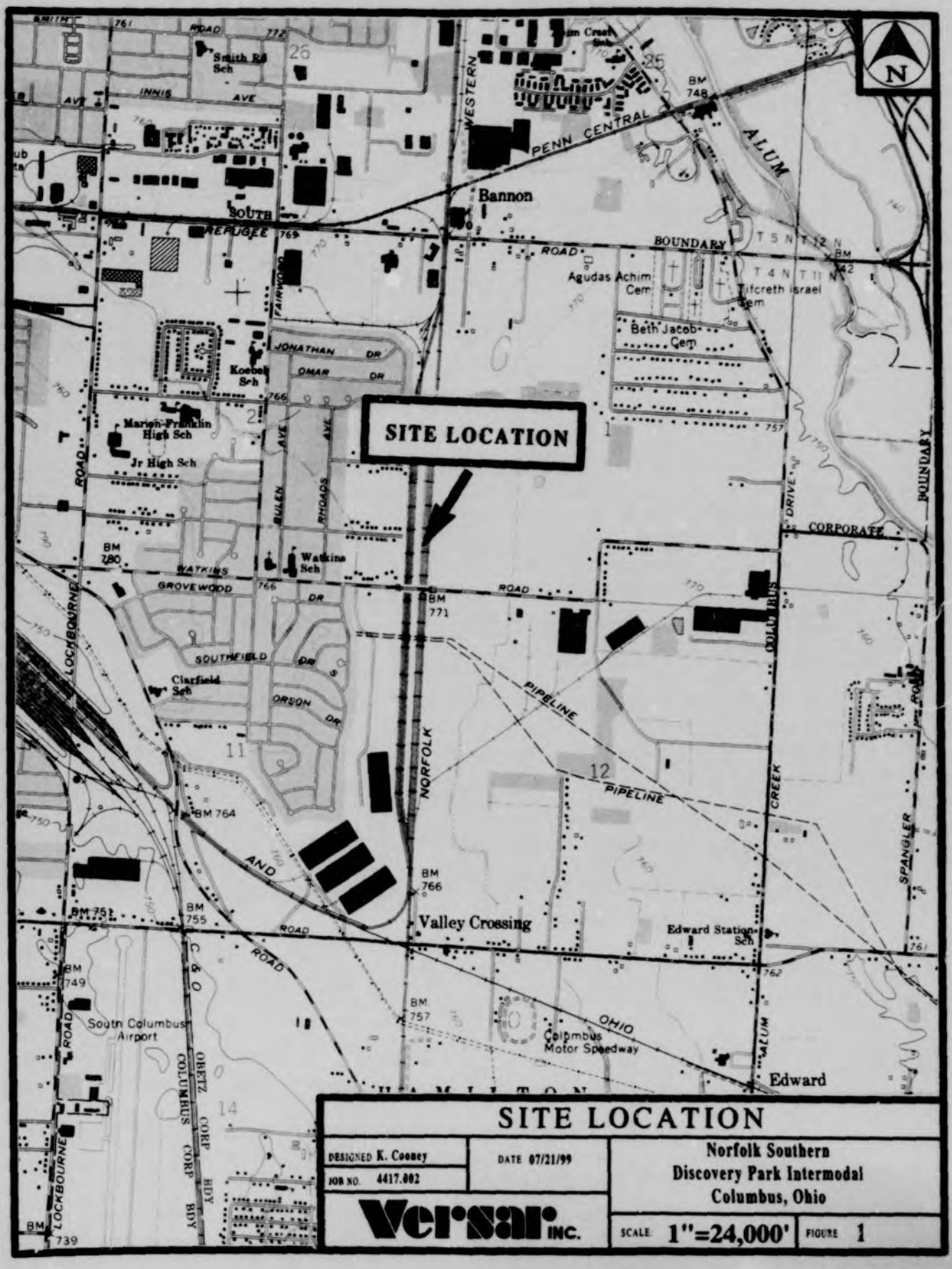
The Discovery Park facility comprises 6 lines of railroad track. The intermodal facility is located in an urban/industrial area. The closest US Census tract indicates there are approximately 2,851 people that reside in the area. The average number of workers on duty at the facility is 40.

Topography of the Discovery Park Intermodal facility is characterized by flat land. The USGS 7.5-minute Series map of the Southeast Columbus, Ohio, Quadrangle shows that the elevation of the property is approximately 771 feet above mean sea level. An unnamed intermittent stream bounds the facility to the east. Surrounding sites appear to be characterized by flat land, with an elevation of approximately 771 feet in all directions.

The Discovery Park Intermodal Facility is located on NS Rail Line Segments:

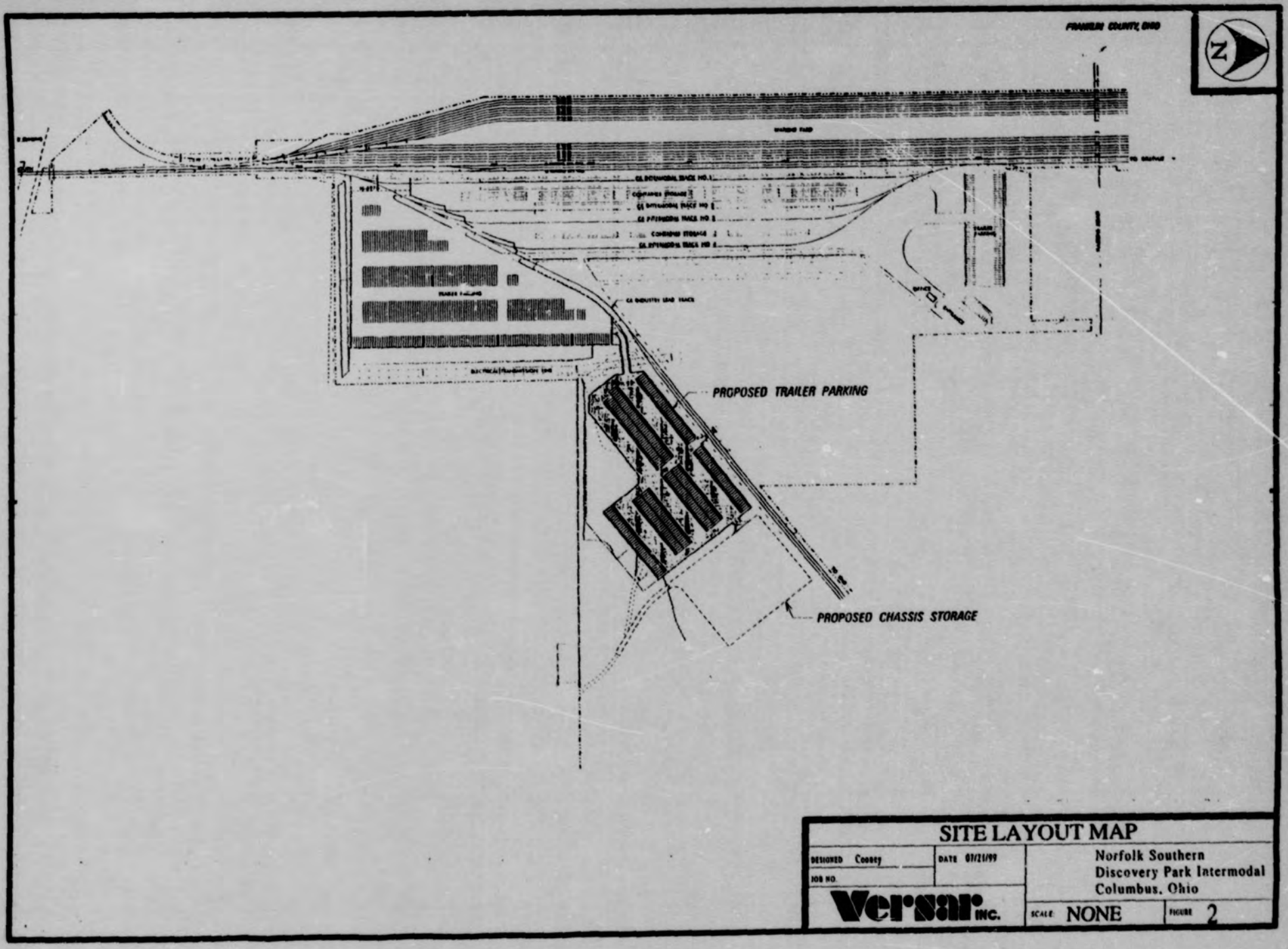
- N-073 from Columbus, OH to Bucyrus, OH
- N-448 from Kenova, OH to Columbus, OH

For the first six months of 1999, an average of 17,656 cars were classified and 3,643 additional cars were transported through this facility each month. In June, 1999, 26,105 cars were classified and 5,106 additional cars were transported through this facility. Rail line segments N-073 and N-448 are both currently Key Routes. As a result of the acquisition of Conrail, the FEIS concluded that the two rail line segments are not expected to experience a significant increase in hazardous materials transportation.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Discovery Park Intermodal Columbus, Ohio
JOB NO. 4417.002		
Versar INC.	SCALE 1"=24,000'	FIGURE 1



SITE LAYOUT MAP

DESIGNED Cooley	DATE 07/21/99	Norfolk Southern Discovery Park Intermodal Columbus, Ohio
JOB NO.		
Versar INC.	SCALE NONE	FIGURE 2

NM13 NEW AMERIPORT/SOUTH PHILADELPHIA, PHILADELPHIA, PENNSYLVANIA

Norfolk Southern plans to construct a new intermodal facility in south Philadelphia at the northeast corner of the former Philadelphia U.S. Naval Station. The intermodal facility would handle new NS intermodal traffic as well as some former Conrail intermodal traffic. Former Conrail intermodal traffic currently uses the Port of Philadelphia and Camden's Delaware River Port Authority's existing AmeriPort intermodal facility which are not operated by NS.

The New AmeriPort/South Philadelphia Intermodal facility will be located on rail line segment S-042 from South Philadelphia to Field, PA. Hazardous materials traffic on this line includes CSX traffic using a different yard in addition to NS/AmeriPort traffic. Line segment S-042 is not projected to become a new Key Route or a new Major Key Route.

This facility is currently in the conceptual design stages and therefore warrants no further analysis at this time.

NM14 ALLENTOWN INTERMODAL, ALLENTOWN, PENNSYLVANIA

The Allentown Intermodal Facility is located in Allentown, Lehigh County, Pennsylvania at 800 River Drive.

The Allentown facility comprises 41 lines of railroad track. The intermodal facility is located in an urban/industrial area. The closest US Census tract indicates there are approximately 7,108 people that reside in the area. The average number of workers on duty at the facility is 20.

Topography of the Allentown Yard is characterized by flat land. The USGS 7.5-minute Series map of the Allentown East, Pennsylvania, Quadrangle shows that the elevation of the property is approximately 320 feet above mean sea level. The Lehigh River bounds the facility to the south. Surrounding sites appear to be characterized by gently sloping land, with elevations ranging from 350 feet to the north, 320 feet to the east and west, and sea level to the south.

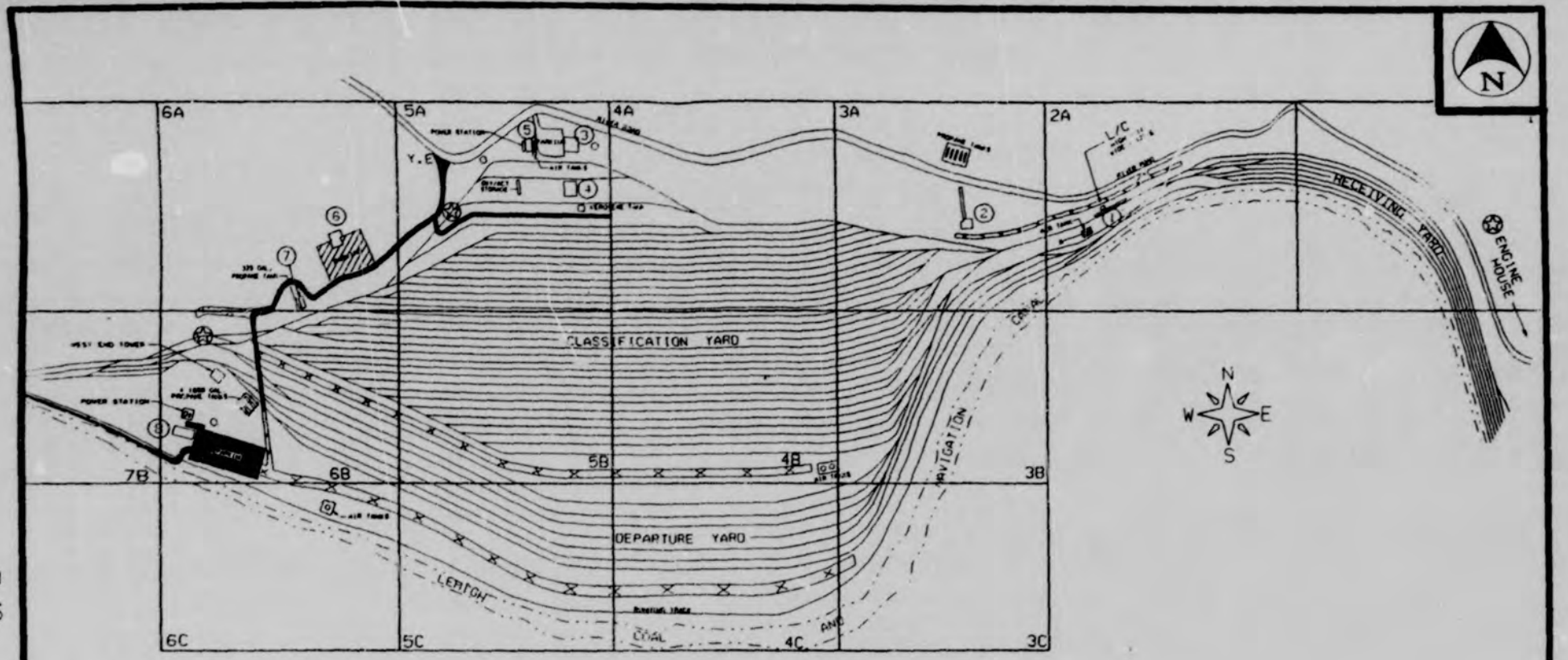
The Allentown Intermodal Facility is located on NS Rail Line Segments:

- N-203 from Bethlehem, PA to Allentown, PA
- N-204 from Allentown, PA to Burn, PA

In June, 1999, 47,626 cars were classified and 18,536 additional cars were transported through this facility. As a result of the acquisition of Conrail, the FEIS concluded that the N-203 rail line segment is a new Key Route. Norfolk Southern is required by the STB to provide new key routes with wayside defect detectors, meet minimum standards for track maintenance, and coordinate emergency planning activities with local officials. Norfolk Southern has met the Board's requirements for this condition and is operating this rail line segment according to the provisions for key routes. Rail line segment N-204 is currently a Key Route.

SITE LOCATION

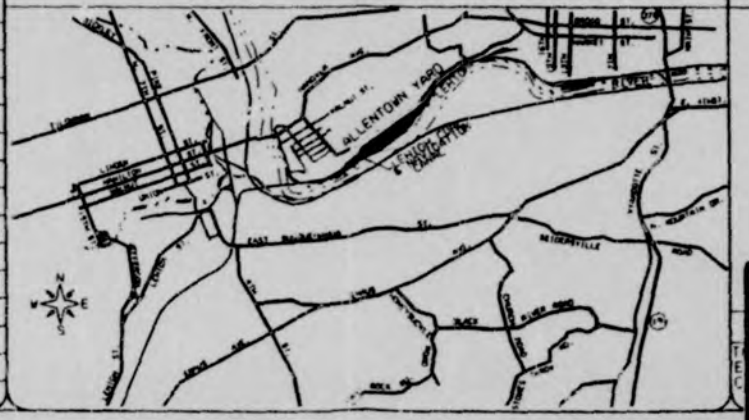
DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Allentown Intermodal Allentown, Pennsylvania
JOB NO. 4417.002		
Versar INC.	SCALE: 1"=24,000'	FIGURE 1



INDEX

PHONE NO.	CO. PHONE NO.	COMPUTER LOCATION	RADIO BASE	EMPLOYEE POPULATION WEEKDAY 1	2	3	WEEKEND 1	2	3
				2	3	3	3	3	3
733 734	(215) 881-5733 (215) 881-5734	X	X	6	3	3	4	3	3
695 696	(215) 881-5695 (215) 881-5696	X	X	28	0	0	10	0	0
721 716	(215) 881-572_ (215) 881-5716		X	4	0	0	0	0	0
				1	1	1	1	1	1
693 694	(215) 881-5693 (215) 881-5694	X		12	8	5	10	8	5
695	(215) 881-5695			3	3	3	3	3	3
691 695	(215) 881-5761 (215) 881-5765		X	12	6	4	6	4	4

LOCATION MAP



LEGEND

oo	AIR TANKS	O	FIRE HYDRANT
— —	SEWER LINE	C/S	COMMUNICATIONS & SIG
C/D	CAR DEPARTMENT	L/C	LOW CLEARANCE (WIDTH &/OR HEIGHT)
	NON-IMPROVED (GRAVEL) ROADWAY		IMPROVED (BLACKTOP) ROADWAY
1A	GRID NUMBER	(1)	REFERENCE NUMBER
	DESIRED LOCATIONS TO TRANSPORT CARS LEAKING HAZARDOUS MATERIAL	Y.E.	YARD ENTRANCE

EASTERN REGION — CONRAIL — CONSOLIDATED RAIL CORPORATION — NEW JERSEY DIVISION

SITE LAYOUT MAP

DESIGNED S. Blair | DATE 07/26/99 | FOR SD

Norfolk Southern
Allentown Yard
Allentown, Pennsylvania

Versar INC. | SCALE NONE | FIGURE 2

NM15 RUTHERFORD, HARRISBURG, PENNSYLVANIA

The Rutherford Intermodal Facility is located Harrisburg, Dauphin County, Pennsylvania at 145 South 63rd Street. The facility operates as Triple Crown Facility.

The Rutherford facility comprises 13 lines of railroad track. The intermodal facility is located in an urban/industrial area. The closest US Census Tract indicates that approximately 1,093 people reside in the area. The average peak number of workers on duty at the facility is 45.

Topography of the Rutherford Yard is characterized by flat land. The USGS 7.5-minute Series maps of the Harrisburg East and Steelton, Quadrangles show that the elevation of the property is approximately 438 feet above mean sea level. There are no surface waters on the site. The closest surface water to the facility is an unnamed creek to the west. Surrounding sites appear to be characterized by gently sloping land, with elevations ranging from 438 feet above msl to the north, 458 feet to the east and west, and 440 feet to the south.

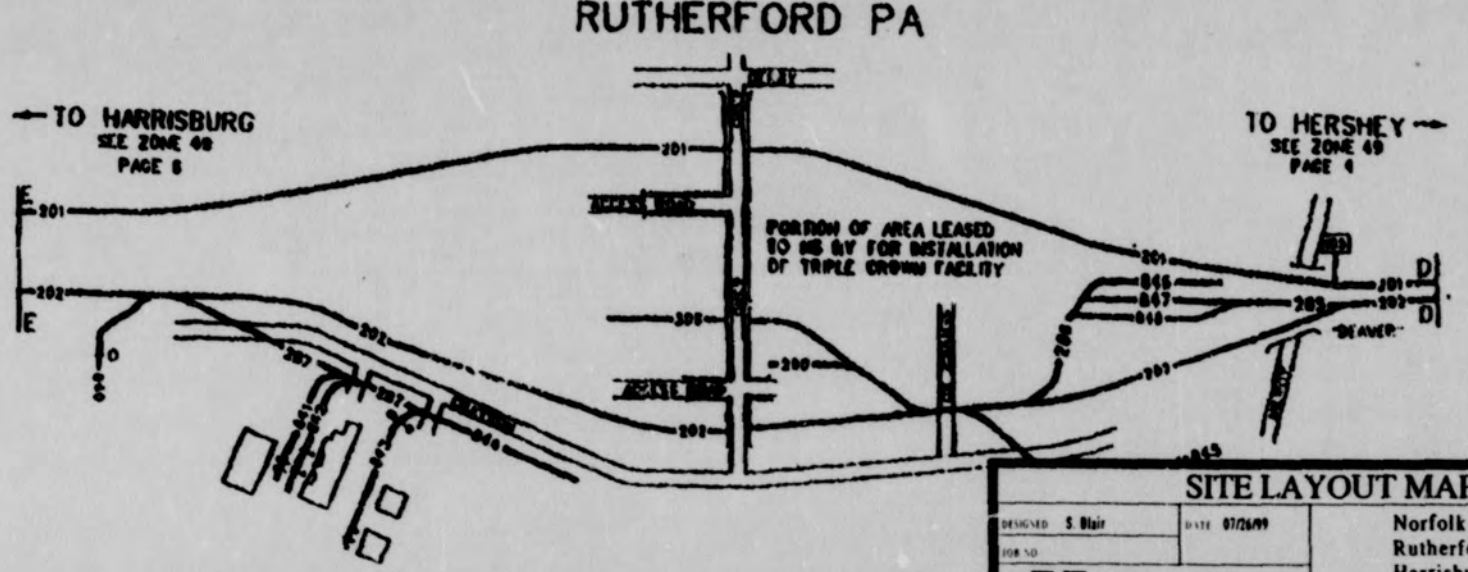
The Rutherford Intermodal Facility is located on NS Rail Line Segments:

- N-090 from Rutherford, PA to Harrisburg, PA
- N-091 from Harrisburg, PA to Hagerstown, PA
- N-093 from Harrisburg, PA to Shocks, PA

In June, 1999, 27,751 cars were classified and 8,699 additional cars were transported through this facility. Rail line segments N-090 and N-093 are both currently Key Routes. Rail line segment N-091 is currently not a Key Route and is not projected to become a new Key Route or a new Major Key Route. As a result of the acquisition of Conrail, the FEIS concluded that these three line segments are not expected to experience a significant increase in hazardous materials transportation.

SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Rutherford Intermodal Harrisburg, Pennsylvania
JOB NO 4417.002		
Versar INC.		SCALE 1"=24,000' FIGURE 1



SITE LAYOUT MAP

DESIGNED S Blair	DATE 07/26/99	Norfolk Southern Rutherford Yard Harrisburg, Pennsylvania
JOB NO		
Versar INC.	SCALE NONE	FIGURE 2

NM16 MORRISVILLE, PENNSYLVANIA

The Morrisville Intermodal Facility is located in Morrisville, Bucks County, Pennsylvania on Lower Morrisville Road.

The Morrisville facility comprises 53 lines of railroad track. The intermodal facility is located in an industrial area. The closest US Census tract indicates that approximately 11,965 people reside in the area. The average peak number of workers on duty at the facility is 50.

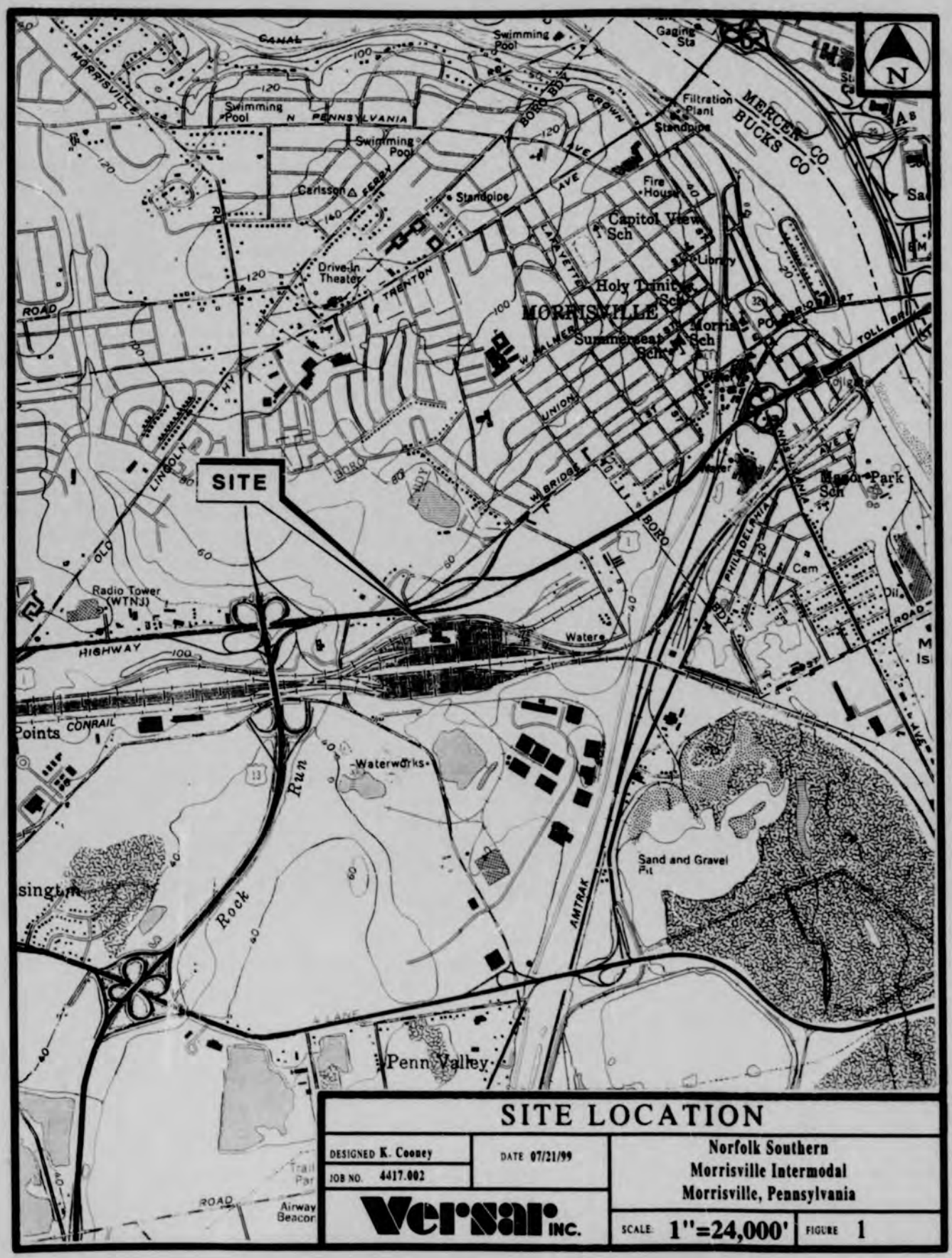
Topography of the Morrisville facility is characterized by flat land. The USGS 7.5-minute Series map of the Trenton West, New Jersey-Pennsylvania, Quadrangle show that the elevation of the property is approximately 40 feet above mean sea level. The Pennsylvania Canal bounds the facility to the east. Surrounding sites also appeared to be characterized by flat land, with elevations of 45 to 60 feet to the north, and 40 feet to the east, south, and west.

The Morrisville Intermodal Facility is located on NS Rail Line Segments:

- N-090 from Rutherford, PA to Harrisburg, PA
- N-094 from WM Jct., PA to Rutherford, PA

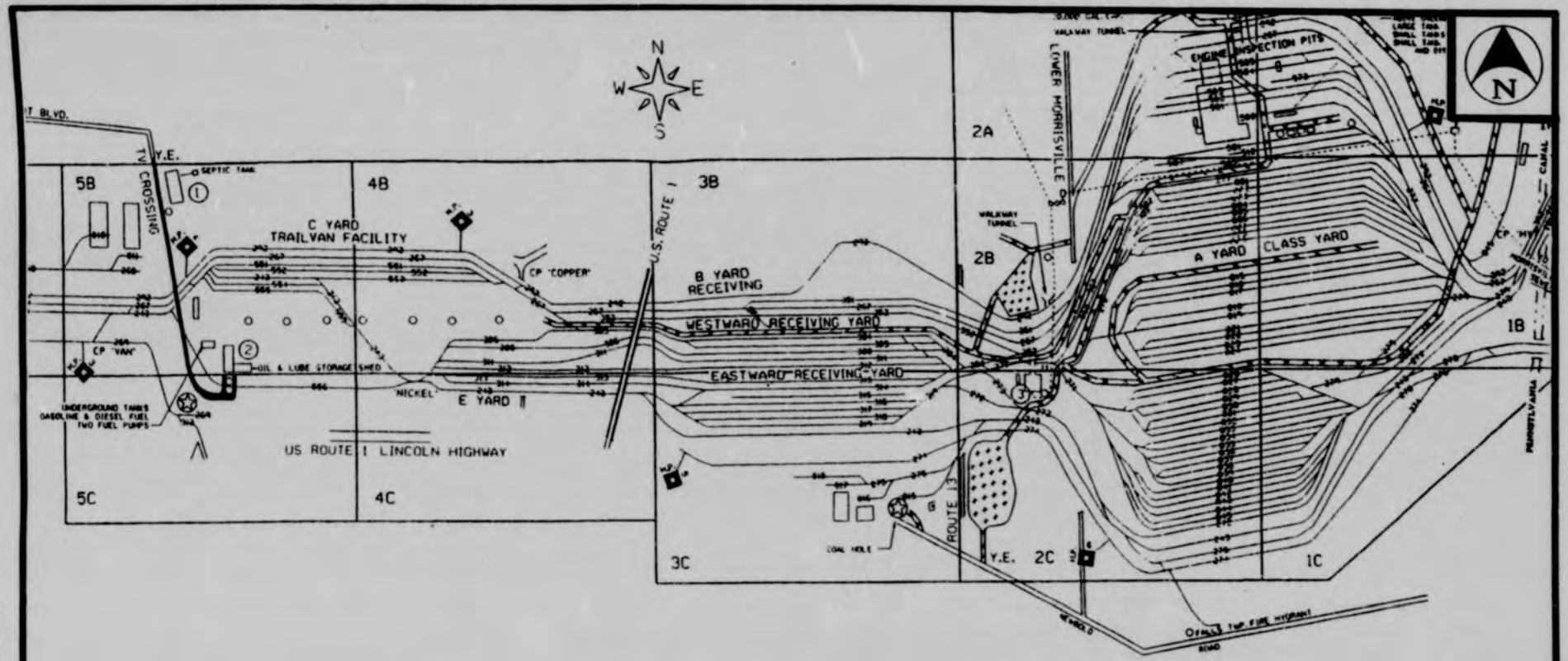
The FEIS reports the number of trucks handled at this facility is going to increase from 164 to 225 trucks per day.

On NS, Morrisville Intermodal is included as part of line-of-road operations. Car accounting does not track monthly car classifications at this facility. Line segments N-090 and N-094 are both currently Key Routes. As a result of the acquisition of Conrail, the FEIS concluded that these two rail line segments are not expected to experience a significant increase in hazardous materials transportation.



SITE LOCATION

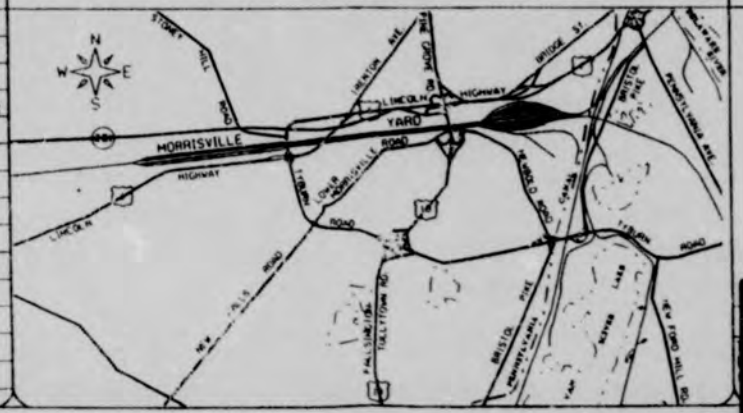
DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Morrisville Intermodal Morrisville, Pennsylvania
JOB NO. 4417.002		
Versar INC.	SCALE: 1"=24,000'	FIGURE 1



INDEX

PHONE NO.	Co. PHONE NO.	COMPUTER LOCATION	RADIO BASE	EMPLOYMENT WEEKDAY 1	EMPLOYMENT WEEKDAY 2	EMPLOYMENT WEEKDAY 3	POPULATION WEEKEND 1	POPULATION WEEKEND 2	POPULATION WEEKEND 3
[illegible]	320-5055		x	2	2	2	2	2	2
[illegible]	320-5005	x	x	22	12	10	5	1	4
[illegible]	320-5012	x	x	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	320-5060								

LOCATION MAP



LEGEND

oo	AIR TANKS	O	FIRE HYDRANT
— — —	SEWER LINE	C/S	COMMUNICATIONS & SIG
C/D	CAR DEPARTMENT	L/C	LOW CLEARANCE (WIDTH &/OR HEIGHT)
	NON-IMPROVED (GRAVEL) ROADWAY		IMPROVED (BLACKTOP) ROADWAY
1A	GRID NUMBER	(1)	REFERENCE NUMBER
	DESIRED LOCATIONS TO TRANSPORT CARS LEAKING HAZARDOUS MATERIAL	Y.E.	YARD ENTRANCE
	PROPANE TANKS		
	GASOLINE TANKS		
	FUEL OIL TANKS		
	OXYGEN & MAPP		

CONRAIL
EASTERN REGION
CONSOLIDATED RAIL CORPORATION
PHILADELPHIA DIVISION
MORRISVILLE, PA.

SITE LAYOUT MAP

DRAWN: S. Blair | DATE: 07/26/99 | JOB No.:

Versar INC.

Norfolk Southern
Morrisville Yard
Morrisville, Pennsylvania

SCALE: NONE | FIGURE: 2

NM17 PITCAIRN, PITTSBURGH, PENNSYLVANIA

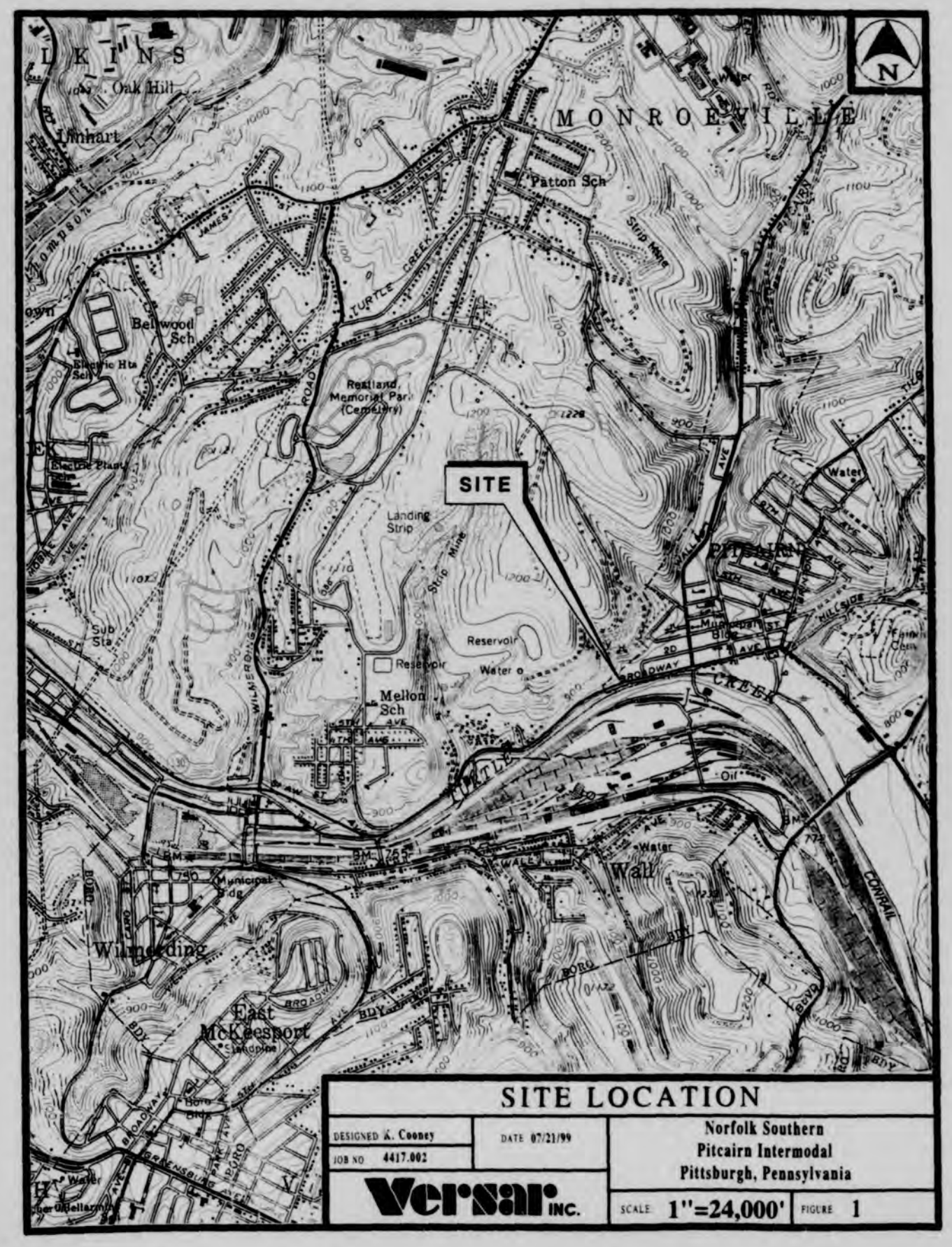
The Pitcairn Intermodal Facility is located in Wall, Pennsylvania at Building 1, Wall Road. Pitcairn operates as an intermodal facility.

The Pitcairn facility comprises 6 acres which includes 21 lines of railroad track. The intermodal facility is located in a town/industrial area. The closest US Census tract indicates that approximately 4,087 people reside in the area. The average peak number of workers on duty at the facility is 27.

Topography of the Pitcairn Facility is characterized by flat land. The USGS 7.5-minute Series map of the Braddock, Pennsylvania, Quadrangle shows that the elevation of the property is approximately 800 feet above mean sea level. The facility is bounded by the Turtle Creek to the north. Surrounding sites appear to be characterized by gently sloping land, with elevations ranging from 800 feet above msl to the north, east, and west, and 850 to 900 feet above msl to the south.

The Pitcairn Intermodal Facility is located on Rail Line Segment N-262 from Marysville to Pitcairn, PA. The FEIS reports the number of trucks handled at this facility is expected to increase from zero to 114 trucks per day.

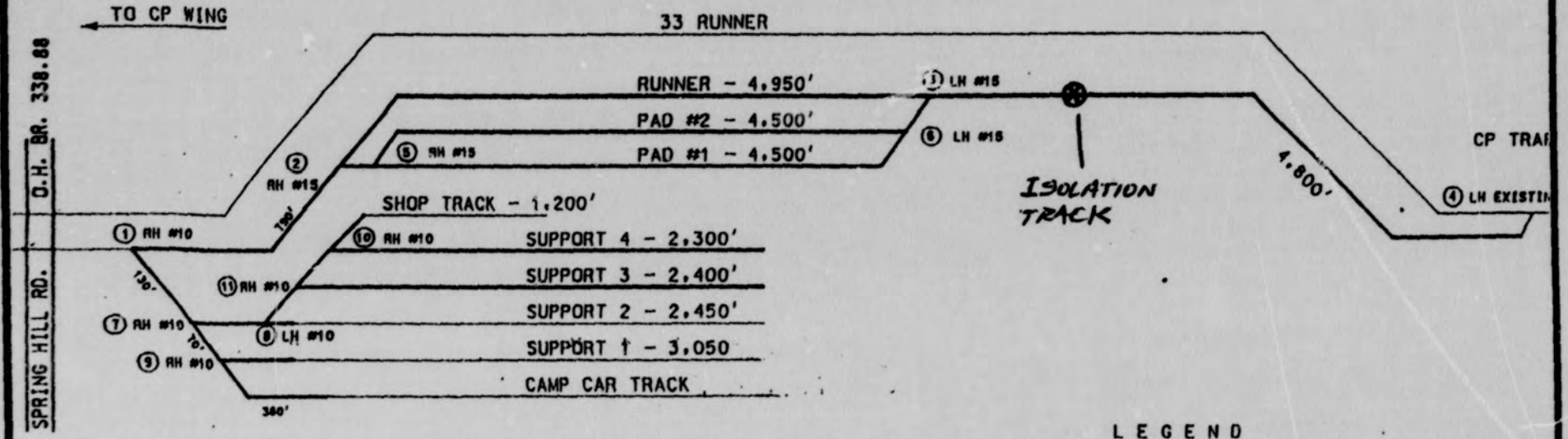
On NS, Pitcairn Intermodal is included as part of line-of-road operations. Car accounting does not track monthly car classifications at this facility. Line segment N-262 is currently a Key Route. As a result of the acquisition of Conrail, the FEIS concluded that the N-262 rail line segment is not expected to experience a significant increase in hazardous materials transportation.



SITE LOCATION

DESIGNED A. Cooney	DATE 07/21/99	Norfolk Southern Pitcairn Intermodal Pittsburgh, Pennsylvania
JOB NO 4417.002		
Versar INC.	SCALE 1"=24,000'	FIGURE 1

PITCAIRN, PA
PROPOSED PITCAIRN INTERMODAL YARD



⚠1 REV. 2-5-96

OGH/PITCAINT.OGN

SITE LAYOUT MAP		
DESIGNED S. Blair	DATE 07/26/99	Norfolk Southern Pitcairn Yard Pittsburgh, Pennsylvania
JOB NO		
Versar INC.	SCALE NONE	FIGURE 2

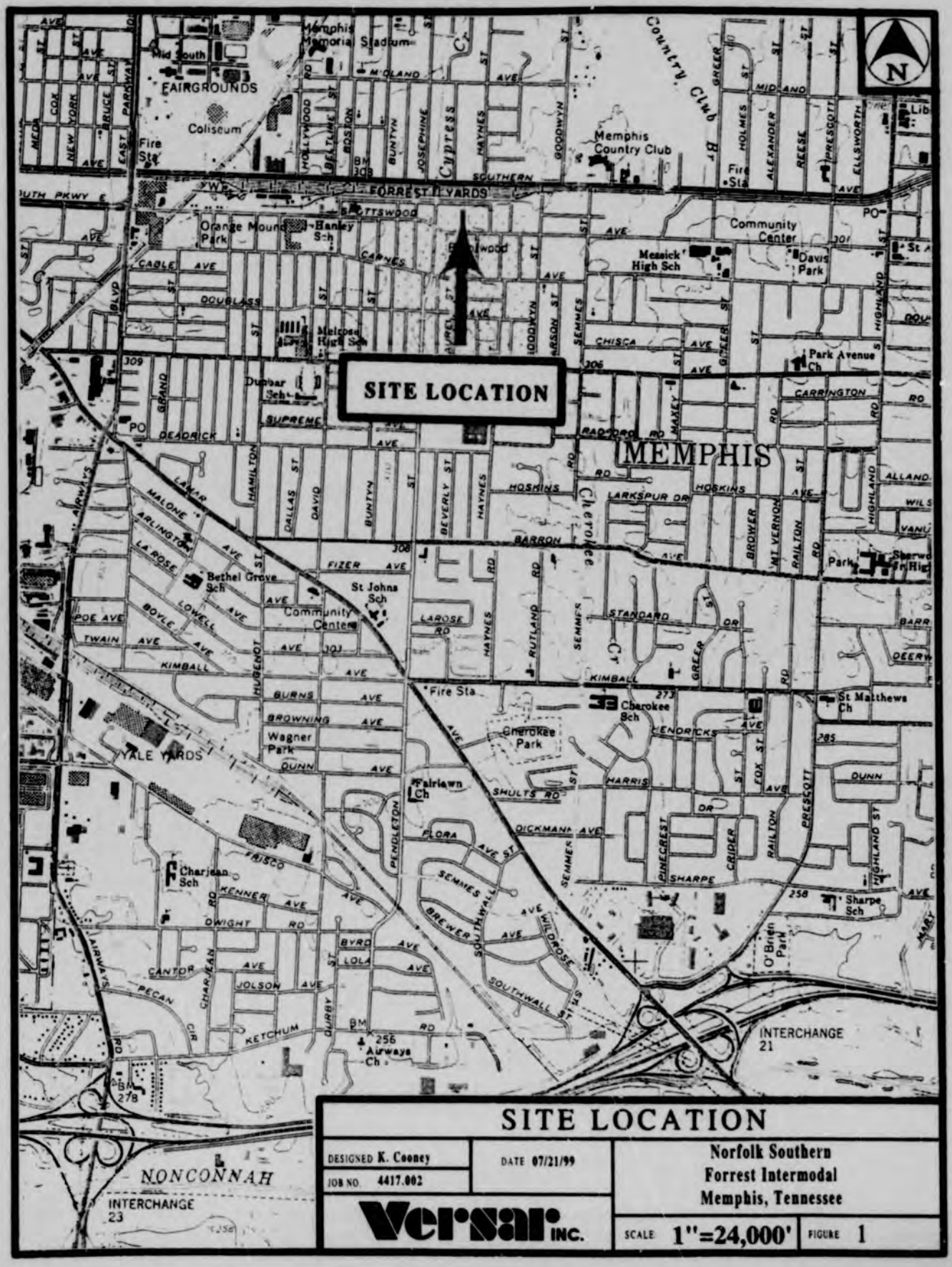
NM18 FORREST, MEMPHIS, TENNESSEE

The Forrest Intermodal Facility is located in Memphis, Shelby County, Tennessee in the far southeast corner of the state at 2600 Spottswood Avenue. The facility houses RHWY and Stack Tracks for loading and unloading intermodal containers and trailers.

The Forrest facility comprises 21 lines of railroad track. The intermodal facility is located in an urban area. The closest US Census tract indicates that approximately 5,565 people reside in the area. The average peak number of workers on duty at the facility is 51.

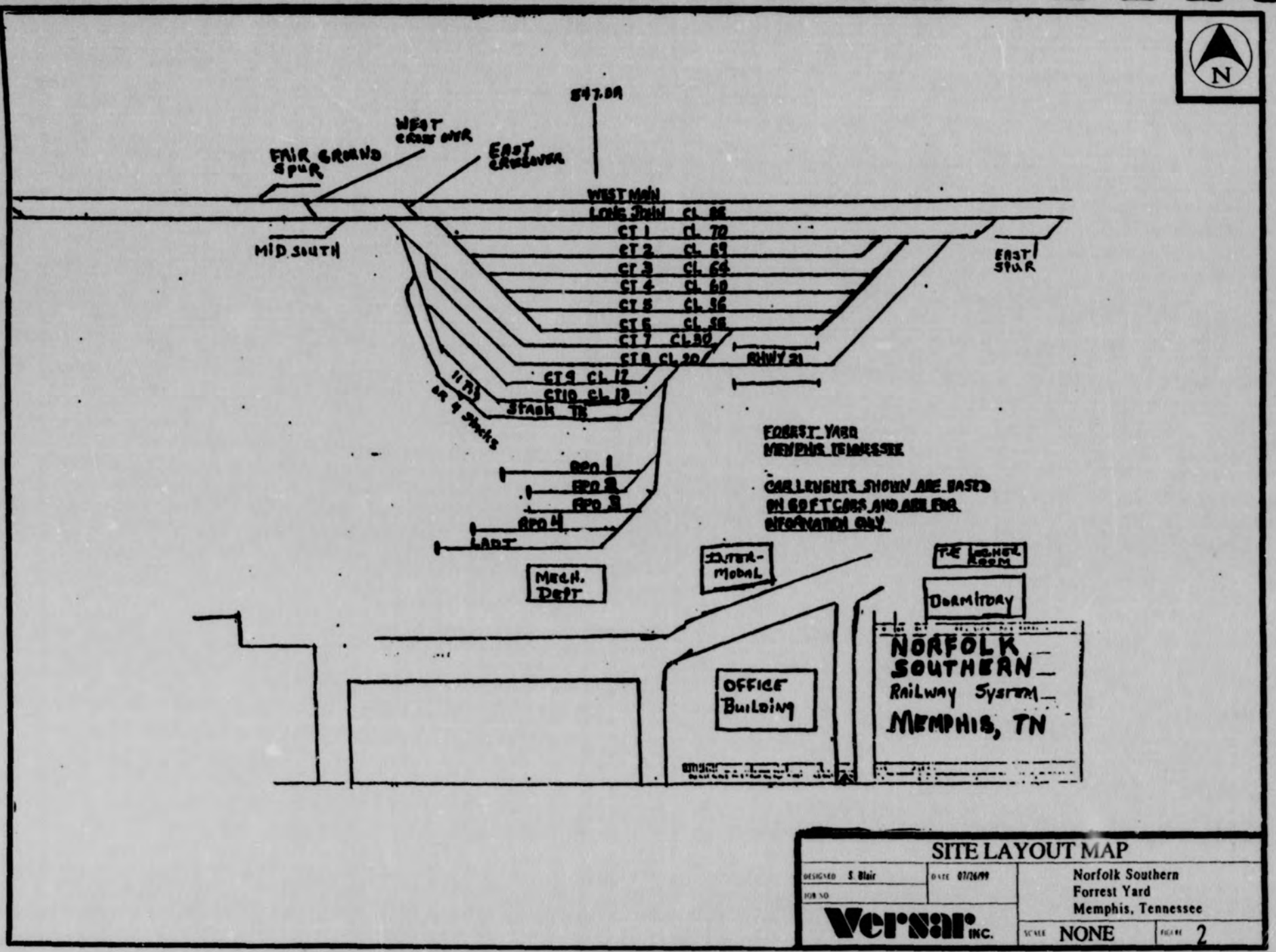
Topography of the Forrest Yard facility is characterized by flat land. The USGS 7.5-minute Series map of the Memphis, East, Tennessee, Quadrangle shows that the elevation of the property is approximately 300 feet above mean sea level. There are no surface waters on the site. The closest surface water to the facility is the Country Club Branch (approximately 4,000 feet to the northeast). Surrounding sites appear to be characterized by gently sloping land, with elevations ranging from 300 feet to the north, east, and west, and 340 feet to the south.

The Forrest Intermodal Facility is located on Rail Line Segment N-397 from Wilson, AL to Memphis, TN. In June 1999, 35,006 cars were classified and 49 additional cars were transported through this facility. Rail line segment N-397 is currently a Key Route. As a result of the acquisition of Conrail, the FEIS concluded that this rail line segment is not expected to experience a significant increase in hazardous materials transportation.



SITE LOCATION

DESIGNED K. Cooney	DATE 07/21/99	Norfolk Southern Forrest Intermodal Memphis, Tennessee
JOB NO. 4417.002		
Versar INC.	SCALE 1"=24,000'	FIGURE 1



SITE LAYOUT MAP

DESIGNED S. Blair	DATE 07/26/99	Norfolk Southern Forrest Yard Memphis, Tennessee
JOB NO		
Versar INC.	SCALE NONE	FIGURE 2