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**System Energy Resources, Inc.**
1340 Echelon Parkway
Jackson, MS 39286-1995

CNRO-2006-00011

February 22, 2006

U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001
Attention: Document Control Desk

DOCKET: 52-009

SUBJECT: Response to Request for Additional Information Regarding the Grand Gulf Early Site Permit Final Safety Evaluation Report (TAC MC 1378)

REFERENCE:

1. System Energy Resources, Inc. (SERI) letter to USNRC – Early Site Permit Application (CNRO-2003-00054), dated October 16, 2003.
2. SERI letter to USNRC – Grand Gulf Early Site Permit Application Revision 2 (TAC No. MC 1378) (CNRO-2005-00055), dated October 3, 2005.
3. USNRC letter to SERI - Request for Additional Information Letter No. 3 – System Energy Resources, Inc., Early Site Permit Application for the Grand Gulf ESP Site (TAC No. MC 1378) (CNRI-2004-00013), dated July 23, 2004.
4. SERI letter to USNRC - Early Site Permit - Response to Request for Additional Information Letter No. 3 (CNRO-2004-00062), dated September 14, 2004
5. ACRS letter to Executive Director for Operations USNRC – Early Site Permit Application for the Grand Gulf Site and the Associated Final Safety Evaluation Report, dated December 23, 2005
6. USNRC letter to SERI - Revision to the Grand Gulf Final Safety Evaluation Report (TAC MC 1378) (CNRI-2006-00003), dated February 7, 2006.

CONTACT:

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| Name | George A. Zinke |
| Mailing Address | 1340 Echelon Parkway<br>Jackson, MS 39213 |
| E-Mail Address | gzinke@entergy.com |
| Telephone Number | 601-368-5381 |

On January 12, 2006, the NRC requested additional information relating to the evaluation of potential explosive hazards along the Mississippi River; this request is further documented in Reference 6, dated February 7, 2006. This letter transmits information as outlined in Attachment 1 to this letter. This request is similar to RAI 2.2-3 (Reference 3) dated July 23, 2004, for which SERI responded in Reference 4, dated September 14, 2004. The response in this letter supersedes the response to RAI 2.2-3 contained in Reference 4. Should you have any questions, please contact me.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on February 22, 2006.

Sincerely,

3/16/06

(DUPLICATE - ORIGINAL SIGNED 2/22/06)

George A. Zinke
Project Manager
System Energy Resources, Inc.

Attachments:

1. Response to Request For Additional Information
2. Review and Identification of Hazardous Cargo on the Mississippi River Warranting Additional Detailed Analysis
3. Mississippi River Hazardous Cargo Data for Years 2003 and 2004, from Waterborne Commerce Statistics Center, U.S. Army Corps of Engineers
4. Proposed Changes to the ESP Application SSAR

cc: Mr. C. J. Araguas, USNRC/NRR
Ms. D. Curran; Harmon, Curran, Spielberg, & Eisenberg, L.L.P.
Mr. W. A. Eaton (ECH)
Mr. B. S. Mallett, Administrator, USNRC/RIV
Mr. J. H. Wilson, USNRC/NRR

Resident Inspector's Office: GGNS

## SSAR Section 2.2, Nearby Industrial, Military and Transportation Facilities and Routes

### Request For Additional Information:

As documented in the NRC letter to System Energy Resources, Inc., (SERI) dated February 7, 2006 (Reference 18):

> On October 21, 2005, the staff issued its final safety evaluation report (FSER) for the Grand Gulf early site permit (ESP) application, and on December 8, 2005, the staff met with the Advisory Committee on Reactor Safeguards (ACRS) to discuss the staff's FSER. By letter dated December 23, 2005 [Reference 12], the ACRS recommended that the staff provide clarification in the FSER regarding the conclusions on potential hazards posed to the proposed site by explosions in transportation accidents along the Mississippi River. After further review, the staff agrees with the ACRS and has determined that more information is necessary to fully characterize the potential hazards at the site.
>
> In its original application, SERI proposed to follow Regulatory Guide (RG) 1.91, "Evaluations of Explosions Postulated To Occur on Transportation Routes near Nuclear Power Plants," in analyzing the hazards identified above. In light of the issue identified by the ACRS, on January 12, 2006, the staff held a conference call (ADAMS Accession Number: ML060240253) (Reference 17) with System Energy Resources Inc. (SERI) and requested that SERI provide additional information to demonstrate how RG 1.91 is being met.

### Response:

The information provided in this response is organized as follows:

A. Introduction
B. Discussion of Regulations and Guidance
C. Approach Summary
D. Review and Identification of Commodities of Interest
E. Review of Detailed Barge Shipment Information
F. Analysis of Local Detonation
G. Evaluation of Vapor Cloud Release and Subsequent Delayed Ignition
H. Risk Assessment
I. Review of Trends in Commodity Shipment Information
J. Proposed Changes to the ESP Application SSAR
K. Conclusions
L. References

## A. Introduction

The above referenced NRC RAI letter of February 2 (Reference 18) was provided as follow-up to discussions held with the NRC Staff on January 12, 2006 (Reference 17). To further clarify the nature of information required to resolve this issue, a conference call was held with NRC staff on February 2, 2006.

It is SERI's understanding, based on discussions with the NRC Staff on February 2, that compliance with Regulatory Guide 1.91 (Reference 20), Position C.1, would require literal compliance with the stand-off distances computed from the Guide's Figure 1, based on a ship-borne cargo of 5000 tons of equivalent TNT. It is SERI's overall intent to approach this analysis using site specific information to determine stand-off distances and other available information, as appropriate, to assess the risk associated with potentially flammable or explosive cargo on the Mississippi River in the vicinity of the proposed ESP site. While this analysis cites and adopts specific insights and assumptions provided in Regulatory Guide 1.91, the demonstration of site suitability with respect to potential hazards from MS River transportation, is based on the criteria, as discussed below, of Regulatory Guide 1.70, Section 2.2.3.1 (Reference 11) and Review Standard RS-002, Section 2.2.3 (Reference 10).

This analysis takes no credit for the elevation differences between the river and the proposed site.

This response supersedes the SERI response to RAI 2.2-3 which provides a similar hazard analysis of LNG related to a potential plume release and delayed ignition, provided in Reference 14.

## B. Discussion of Regulations and Guidance

In accordance with 10 CFR 100.20(b), the Commission will take into consideration in determining the acceptability of a site for power reactor.

> The nature and proximity of man-related hazards (e.g., airports, dams, transportation routes, military and chemical facilities) must be evaluated to establish site parameters for use in determining whether a plant design can accommodate commonly occurring hazards and the risk of other hazards is very low.

In accordance with 10 CFR 100.21(c), this application for site approval must demonstrate that the ESP site meets the following criteria:

> Potential hazards associated with nearby transportation routes, industrial and military facilities must be evaluated and site parameters established such that

> potential hazards from such routes and facilities will pose no undue risk to the type of facility proposed to be located at the site.

Guidance for meeting this regulation is provided in Review Standard RS-002 (Reference 2), Section 2.2.3.

> Offsite and onsite hazards which have the potential for causing onsite accidents leading to release of significant quantities of radioactive fission products, and thus pose an undue risk of public exposure, should have a sufficiently low probability of occurrence and be within the scope of the low probability of occurrence criterion of 10 CFR 100.20.

RS-002 Section 2.2.3 refers to the specific guidance of Reg. Guide 1.70 (Reference 11), Section 2.2.3. This regulatory guide defines design basis events as

> ... those accidents that have a probability of occurrence on the order of about E-7 per year or greater and have the potential consequences serious enough to affect the safety of the plant to the extent that Part 100 guidelines could be exceeded.

Reg. Guide 1.70 defines the accident categories that should be considered. Those accident categories that are directly relevant to the subject NRC Request for Additional Information are: (1) explosions and (2) delayed ignition of flammable vapor clouds.

Regarding explosions, Reg. Guide 1.70 (2.2.3.1, Para. 1) indicates that

> ... attention should be given to potential accidental explosions that could produce a blast overpressure on the order of 1 psi or greater at the nuclear power plant using recognized quantity-distance relationships.

Regarding flammable vapor clouds, Reg. Guide 1.70 (2.2.3.1, Para. 2) indicates that

> ... accidental releases of flammable liquids or vapors that result in the formation of unconfined vapor clouds should be considered. Assuming that no immediate explosion occurs, the extent of the cloud and the concentrations of gas that could reach the plant under "worst case" meteorological conditions should be determined.[1] An evaluation of the effects on the plant of detonation and deflagration of the vapor cloud should be provided.

In summary, the guidance of Reg. Guide 1.70 is understood to mean that transportation related events (involving explosive or flammable materials) determined to produce an estimated blast overpressure of less than 1 psi or a probability of occurrence on the order of about E-07 or less would not be defined as design basis events. Review Standard RS-002 is considered to be consistent with this understanding regarding the probability of occurrence.

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[1] See Section G regarding assumptions of meterological conditions in the plume drift analysis.

## C. Approach Summary

The ESP site is located just west of the existing GGNS Unit 1 facility. The western edge of the proposed power block area of the ESP site is approximately 1.1 miles from the Mississippi River; therefore, this distance is used for determination of overpressure and vapor plume length assessments.

1. An initial screening of commodities included in cargo shipped on the Mississippi River past the ESP site was conducted to identify those materials that warranted more detailed evaluation, that is, "commodities of interest."

2. With commodities of interest identified, additional more detail shipment information was obtained to support reasonably bounding assumptions regarding the amount of each commodity included in a single shipment past the ESP site. This research also provided shipping frequency (pass-the-point data) for each commodity.

3. More detailed analyses were performed of each commodity, including the determination of overpressure at 1.1 miles, taking into account chemical and physical properties, state of the material when shipped, assumed progression of events following the incident that releases the material, reaction kinetics, and release rates. These analyses included the following:

    a. Confined space detonation

    b. Local vapor cloud explosion, and

    c. Evaluation of a vapor cloud formation and dispersion downwind toward the ESP site, with a delayed ignition.

4. For those commodities with a potential overpressure value in excess of 1 psi, or with predicted concentrations at the site above the lower explosive limit, a risk assessment was performed to determine if the associated probability of occurrence of the event was acceptably low.

5. Trends in shipment data were assessed in terms of the time dependence of cargo quantities used in these analyses.

6. Overall conclusions regarding demonstration of compliance with relevant siting requirements of Part 100.

A fundamental aspect of this approach was that analysis and estimates used assumptions that were as representative of the specific site as was practicable. For example, in that the ESP site is significantly north of deep river ports, consideration of cargoes was restricted to that characteristic of shallow-draft river barges used in this region of the river. This reduces the quantity of flammable liquid or gas that could be involved in an accident. Site-specific meteorology and topographical features of the area in relation to the ESP site were also considered. This approach, therefore, was considered appropriate for judging site suitability but was not unnecessarily conservative.

## D. Review and Identification of Commodities of Interest

A review of commodities included in cargo shipped on the Mississippi River past the ESP site was conducted to identify those materials that warranted more detailed evaluation, that is, "commodities of interest." This review was based primarily on consideration of chemical and physical properties of the subject materials, as well as the state in which they are shipped. The purpose of the review was to conservatively identify those materials that could potentially create an explosion (in the immediate area or via extended vapor cloud) resulting in a blast overpressure on the order of 1 psi or greater at the western edge of the ESP site power block area.

SSAR Table 2.2-4[2] lists hazardous cargoes transported on the Mississippi River past the ESP site. Attachment 2 to this report provides an assessment of the commodities listed in SSAR Table 2.2-4 to identify which warranted additional analysis as a potential explosive hazard. Those commodities so identified were:

1. Crude Petroleum (Code 2100[3])
2. Gasoline (Code 2211)
3. Liquefied Natural Gas (Code 2640)
4. Naphtha and solvents (Code 2429)
5. Acyclic hydrocarbons (Code 3211)
6. Benzene and toluene (Code 3212)
7. Alcohols (Code 3220)
8. Ammonia (Code 3273)

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[2] SSAR Table 2.2-4 reflects year 2000 data from the US Army Corps of Engineers (USACE), Waterborne Commerce Statistics Center. To support this RAI response, data for years 2003 and 2004 was obtained from the USACE WCSC.

[3] Commodity Classification Codes, used by the US Army Corps of Engineers. Codes are listed in each annual report published by Waterborne Commerce Statistics Center. See Reference 16, p. ix.

## E. Review of Detailed Barge Shipment Information

1. Waterborne Commerce Statistics Center: "Pass the Point" Reports

In response to NRC RAI 2.2-3, an analysis of the potential hazard related to the delayed ignition of a flammable natural gas plume (from LNG) was evaluated (Reference 14). In part, that analysis was based on LNG shipment information transported past the ESP site, provided by the US Army Corps of Engineers (USACE), Waterborne Commerce Statistics Center (WCSC). This response to the RAI of Reference 18 involves a considerably larger scope (e.g., multiple commodities, multiple explosion scenarios) and different methodology (i.e., use of the ALOHA code for extended vapor plumes). In addition, more detailed and updated shipment data was provided for LNG for this analysis. Access to more detailed WCSC information, as well as an improved understanding of the shipment data provided, resulted in an increased value of the volume of LNG used in the analyses presented herein beyond that used in the Reference 14 analysis. For these reasons, this RAI response fully supersedes the Reference 14 response to RAI 2.2-3.

To support analysis of the commodities of interest, information was required regarding cargo tonnage and frequency shipped past the ESP site. The WCSC provided the most available, suitable information for this purpose. Based on reports filed monthly by vessel operators, WCSC compiles "detailed data on the movement of vessels and commodities at the ports and harbors and on the waterways and canals of the United States."[4] This data is collected, compiled, evaluated, and reported to meet the specific needs of the USACE.

The USACE was cooperative in providing the requested, tailored reports for the evaluation presented in this response. However, as discussed below, the data has certain limitations due to the particular needs and purposes of the WCSC and also to protect the confidentiality and proprietary interests of vessel operators providing the data.

The WCSC publishes annual reports on waterborne commerce, including cargo shipped on the Mississippi River. These annual reports are publicly available on the WCSC website. To obtain more detailed data for this RAI response regarding cargo tonnage and numbers of shipments specifically past the ESP site, the USACE provided database reports for the above listed commodities for the last two years of collected data, that is, 2003 and 2004. These "Pass-the-Point" (PTP) reports provided aggregated barge, cargo, and shipment frequency information for the above listed commodities in the years noted. To protect confidentiality and the proprietary interests of information providers (shippers), the USACE aggregated the data provided in the PTP reports.

[4] WCSC Report for Calendar Year 2003 (Reference 16, p. iii).

2. Reasonable Bound for Commodity Cargo for this Analysis

Based on discussions[5] with USACE staff as to the correct interpretation of the PTP reports, it was concluded that the PTP data could be used to accurately reflect the following parameters:

- Carrying capacity of a single barge used for a given commodity (shipped in the year, past the ESP site)
- Total tonnage of a given commodity (shipped in the year, past the ESP site)
- Number of shipments of that commodity (shipped in the year, past the ESP site)
- Average tonnage per shipment for that commodity (shipped in the year, past the ESP site)

Table E-1 presents summary information for the various commodities, based on the PTP data reports provided by the USACE.

Due to aggregation of data, the USACE PTP reports do not provide data on individual shipments. Thus, the PTP reports does not provide the actual tonnage in a single barge, maximum tonnage in a single shipment, nor the number of barges involved in single shipment. However, as used in this analysis, the maximum carrying capacity of a single barge, which is provided in the PTP reports, is considered an appropriate bounding value.

It is recognized that a single shipment or "tow" typically involve multiple barges. Based on discussions with the US Coast Guard (USCG), it is understood that there are no regulations, broadly applicable to the Mississippi River, that would restrict the total number of barges per tow or total tonnage shipped in a single tow, even for hazardous cargo. Inquiries were made as well with a leading vessel operator on the Mississippi River. From those discussions, it is understood that, in general, limits on tonnage and number of barges are set by seasonal constraints on the river such as river stage (water level), tow boat horsepower, and particular local features of the waterway (e.g., locks). These constraints would limit barge contents due to allowable draft and/or limit the number of barges that can be safely handled due to navigation and vessel control considerations.

As stated, the USACE PTP reports did not indicate number of barges or maximum cargo in an individual shipment. However, the maximum single barge capacity utilized in shipping each commodity provides a reasonable bound for the amount of each commodity assumed for this analysis. The following provides a basis for this conclusion.

[5] Communications with USACE staff are summarized in the Memo to File, dated 2/13/2006, provided at the conclusion of Attachment 3.

a. As shown in Table E-1, the maximum barge capacity was consistently greater than the average TOTAL cargo tonnage per shipment past the site (Avg. TONS/TRIP). This is understood to mean that even though multiple barges may be used in a shipment, the barges are either smaller in capacity than the maximum barge (listed) and/or the barges are not 100% filled. This latter point is consistent with discussions held with barge operators that barges are typically not filled to capacity for shipment.
b. It is reasonable to assume the initial damage, spill, cloud drift and/or explosion would involve only one barge associated with the initiating incident. Should additional barges become involved, related explosions, if they occurred, would be subsequent in time and neither coincident with nor additive to the effects associated with those from the first barge explosion.

## Table E-1. Commodity Shipment Information, Past the ESP Site (Note 1)

| Year | Commodity | Max. Barge Capacity (Note 2) | Total TRIPS | Total TONS (Note 3) | Avg. TONS/TRIP (Avg Total Shipment past site) | Ratio: Avg Total Shipment to Max Barge Capacity |
|---|---|---|---|---|---|---|
| **2003** | Gasoline | 5,654 (Note 4) | 1,109 | 2,974,473 | 2,682 | 0.47 |
| **2003** | Distillate Fuel Oil | 5,654 (Note 4) | 1,207 | 3,340,011 | 2,767 | 0.49 |
| **2003** | Naphtha & Solvents | 5,000 | 207 | 500,450 | 2,418 | 0.48 |
| **2003** | LNG | 4,850 | 85 | 92,298 | 1,086 | 0.22 |
| **2003** | Benzene | 3,852 | 35 | 57,271 | 1,636 | 0.42 |
| **2003** | Toluene | 2,400 | 20 | 30,038 | 1,502 | 0.63 |
| **2003** | Ammonia | 2,902 | 294 | 731,960 | 2,490 | 0.86 |
| **2003** | Acyclic Hydrocarbons | 4,260 | 14 | 8,585 | 613 | 0.14 |
| **2003** | Crude Petroleum | 4,670 | 231 | 874,953 | 3,788 | 0.81 |
| **2004** | Gasoline | 4,850 | 806 | 2,062,837 | 2,559 | 0.53 |
| **2004** | Distillate Fuel Oil | 5,029 | 1,088 | 2,952,750 | 2,714 | 0.54 |
| **2004** | Naphtha & Solvents | 5,386 | 315 | 842,406 | 2,674 | 0.50 |
| **2004** | LNG | 3,891 | 71 | 89,027 | 1,254 | 0.32 |
| **2004** | Benzene | 3,500 | 31 | 53,055 | 1,711 | 0.49 |
| **2004** | Toluene | 4,596 | 41 | 81,989 | 2,000 | 0.44 |
| **2004** | Ammonia | 2,902 | 317 | 787,952 | 2,486 | 0.86 |
| **2004** | Acyclic Hydrocarbons | 4,260 | 9 | 12,919 | 1,435 | 0.34 |
| **2004** | Crude Petroleum | 4,670 | 296 | 1,066,176 | 3,602 | 0.77 |

Notes:

1. Information presented in this table is based on WCSC "Pass–the-Point" data reports (Reference 16).
2. This value represents the capacity of the largest single barge used in shipment of the subject commodity listed in the PTP report for the given year. In the WCSC data, barge capacity is listed under "CAP_TONS."
3. Total tonnage of a commodity shipped in a year past the ESP site. As discussed in the response, the PTP reports present data in an aggregated form. Data for multiple shipments are grouped to protect the confidentiality of the reporting vessel operator. Due to this method of presentation, a given "row" in the PTP report represents data for a number of shipments (each using the same barge type and capacity). Therefore, the PTP report does not provide data on an individual shipment. Based on discussions with USACE staff, it is understood that the sum of tonnage for a given commodity provides an accurate value for the total tonnage shipped in a given year. Total tonnage, shown in this table, reflects that sum.
4. Based on research conducted in support of this response, this barge was apparently used only once for a gasoline shipment in 2003 (none in 2004) and is not planned for future MS River service for at least the next 5 years (Reference 42). The next largest barge has a capacity of 5386 tons. While not frequently used in shipping (per review of the PTP data), the larger barge capacity was used for analysis of gasoline in this response. This barge capacity was also used for the analysis of alcohols since barge shipment information was not provided for alcohols, thus the largest barge was assumed.

## F. Analysis of Local Detonation

Additional screening is done to examine several possible scenarios. These scenarios include confined vapor cloud explosion (VCE), local (free) VCE, remote VCE and fire risk from a flammable gas plume.

Confined Vapor Cloud Explosion

Reg. Guide 1.91 (Reference 20) cites an inequality for R, the safe distance to an overpressure of 1 psi, as

$$R \geq 45\, W^{1/3} \tag{1}$$

where W = equivalent mass of trinitrotoluene (TNT) ($lb_m$), and R is in feet.

The equivalent mass of TNT is found by

$$W = m\,(HC_{commodity} / HC_{TNT}) \tag{2}$$

where m = the mass of the commodity in question and $HC_{TNT}$ and $HC_{commodity}$ are the heats of combustion of TNT and the commodity, respectively. The heat of combustion for TNT is 4,680 kJ/kg (Reference 9).

The confined vapor cloud explosion scenario assumes that the transport vessel has been breached and sufficient material has been lost to leave a vapor space filled with an explosive gas mixture. An ignition source is introduced and combustion occurs. Due to the confined space, the internal pressure rises rapidly and eventually ruptures the vessel. This magnifies the detonation effects. Reg. Guide 1.91 notes "A reasonable upper bound to the blast energy potentially available based on experimental detonations of confined vapor clouds is a mass equivalence of 240 percent".

The mass of material that can be confined in the hold of the transport is limited, however, due to removal of a significant portion of the commodity being necessary for voiding the space. The mass of the commodity involved in a confined vapor space explosion is, therefore, estimated as

$$m = M\,(\rho_{vapor}/\rho_{liquid}) / 0.80 \tag{3}$$

where M = the mass of the maximum barge cargo[6] of that commodity, $\rho_{vapor}$ is the vapor density and $\rho_{liquid}$ is the liquid density.

[6] As discussed in Section E, the capacity of the largest barge was used as the reasonable bound for the amount cargo considered in these analyses.

This estimation assumes that the transport is initially 80% full of liquid, with 20% vapor space remaining. Based on the data presented in Table E-1, and since the maximum single barge capacity is used for M, this is considered a reasonable assumption.

Therefore, for the confined VCE, combining equations 1, 2, 3 and the 240% mass equivalence, yields

$$R \geq 45\ [(2.40/0.80)\ M\ (\rho_{vapor}/\rho_{liquid})\ (HC_{commodity}/HC_{TNT})]^{1/3} \qquad (4)$$

where
- $R$ = The safe distance to an overpressure of 1 psi (feet)
- $M$ = The mass of the maximum barge cargo of that commodity ($lb_m$)
- $\rho_{vapor}$ = The vapor density ($lb_m/ft^3$)
- $\rho_{liquid}$ = The liquid density ($lb_m/ft^3$)
- $HC_{commodity}$ = The heat of combustion of the commodity (kJ/kg)
- $HC_{TNT}$ = The heat of combustion of TNT (4,680 kJ/kg)

Local Vapor Cloud Explosions

As noted above, Reg. Guide 1.91 cites an inequality for R, the safe distance to an overpressure of 1 psi based on an equivalent mass of TNT (equations 1 and 2 above). The Reg. Guide also states that for "detonations of vapor clouds formed after an accidental release," "there have been accidents in which estimates of the calorific energy released were as high as 10 percent" (Reference 20). Therefore, for a VCE, a yield of 10% is used. This is consistent with the EPA Guidance for Risk Management (Reference 9).

For the most conservative VCE case in terms of the mass involved in the VCE, it is assumed that all of the mass of the shipment is released, evaporates and remains local to the accident site. Therefore, all of the mass is involved in the VCE. For VCEs remote to the site, this is overly conservative and dispersion effects are taken into account.

Therefore, for the local VCE, combining equations 1, 2, the 10% yield, and the involvement of the maximum barge capacity load, the distance to a 1 psi overpressure is found by

$$R \geq 45\ [0.10\ M\ (HC_{commodity}/HC_{TNT})]^{1/3} \qquad (5)$$

where
- $R$ = The safe distance to an overpressure of 1 psi (feet)
- $M$ = The mass of the maximum barge capacity for that commodity ($lb_m$)
- $HC_{commodity}$ = The heat of combustion of the commodity (kJ/kg)
- $HC_{TNT}$ = The heat of combustion of TNT (4,680 kJ/kg)

From the more conservative length generated to an overpressure at the plant site, the "at-risk" distance on the river is calculated. This is the length of travel on the river wherein an accident could occur and generate an overpressure event at the ESP site power block area in excess of 1 psi. Since the distance from the river to the ESP plant site is 1.1 miles, the at-risk distance up the river, Y/2, is

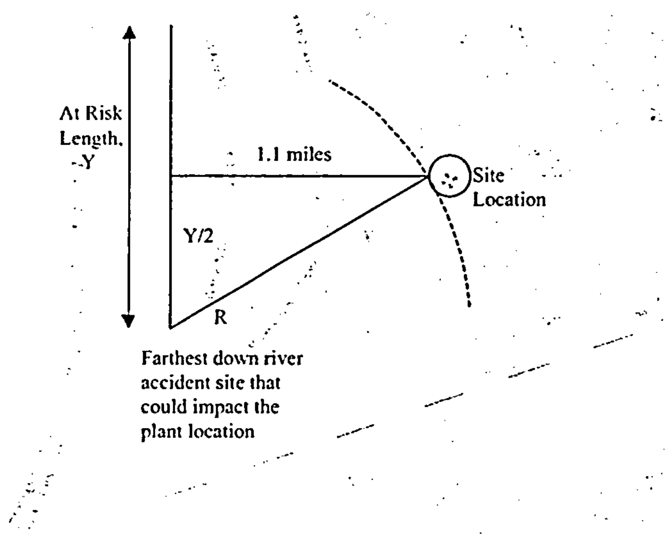
$$(Y/2)^2 = (R/5280)^2 - (1.1 \text{ miles})^2 \quad (6)$$

The total "at-risk" distance includes the same distance down river (see Figure F.1), which yields

$$Y = 2\sqrt{\left(\frac{R}{5280}\right)^2 - (1.1 \text{ miles})^2} \quad (7)$$

The results are presented in Table F-1.

**Figure F.1: Estimation of "At-Risk" Distance on River**




Map obtained from of www.topozone.com

**Table F-1: Results of Calculations of At-Risk Distance to 1 psi Overpressure by Confined and Local Vapor Cloud Explosions (VCEs)**

| | | Crude | | LNG | | | | Naphtha and Solvents | | Acyclic Hydrocarbons | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Petroleum | Gasoline | Methane | Ethane | Ethylene | Propane | Naphtha | Acetone | Pentane | Acetylene |
| Maximum Barge Cargo Size | tons | 4,670 | 5,654 (Note 1) | 4,850 | 4,850 | 4,850 | 4,850 | 5,386 | 5,386 | 4,260 | 4,260 |
| Distance to Overpressure: Confined VCE | miles | 0.94 | 1.00 | 0.97 | 0.87 | 0.82 | 0.89 | 1.00 | 0.75 | 0.91 | 0.59 |
| Distance to Overpressure: Local VCE | miles | 1.72 | 1.83 | Note 3 | | | | 1.84 | Note 4 | 1.71 | 1.76 |
| "At Risk" Length | miles | 2.63 | 2.92 | No risk to site | | | | 2.95 | No risk to site | 2.63 | 2.74 |

| | | Benzene and Toluene | | Alcohols (Note 2) | | Ammonia |
|---|---|---|---|---|---|---|
| | | Benzene | Toluene | Methanol | Ethanol | |
| Maximum Barge Cargo Size | tons | 3,852 | 4,596 | 5,654 | 5,654 | 2,902 |
| Distance to Overpressure: Confined VCE | miles | 0.81 | 0.91 | 0.55 | 0.68 | 0.35 |
| Distance to Overpressure: Local VCE | miles | 1.66 | 1.76 | Note 4 | | Note 4 |
| "At Risk" Length | miles | 2.49 | 2.76 | No risk to site | | No risk to site |

Notes:

1. This barge capacity reflects the conservative use of the largest barge used to transport gasoline even though it was used only once in 2003 for gasoline and is no longer in service (at least for the next 5 years) on the MS River (Reference 42).
2. Specific shipment information on alcohols was not available. The maximum barge size for any commodity (conservative, see Note 1) was assigned to the alcohols.
3. Evaporated LNG, when unconfined, is highly unlikely to experience a VCE. Rather, LNG gasses experience a slower deflagration that does not produce a serious overpressure. (See additional discussion on LNG behavior in Attachment 2.)
4. Acetone, alcohols, and ammonia all are highly soluble in water. A spill on the river surface would be quickly dispersed down river through dissolution of the material in the river.

Sensitivity Analysis
A sensitivity analysis was performed looking at barge capacities 10%, 20%, and 30% below the maximum capacity for each commodity. This was done to explore the possibility that smaller barges could be used to transport the same total cargo (or barges could be less than 100% filled). With decreased load per trip, the "at-risk" length would decrease as well. However, the number of vessel trips would then increase. See Table F-2. This sensitivity of barge capacity, "at-risk" length, and shipping frequency were considered in the risk assessment, discussed in Section H.

Summary of Confined Space and Local VCE Analyses
The initial screening of the hazardous commodities eliminated all but eight commodities as being incapable of impacting the site based on a river accident. The eight commodities that could not be eliminated were crude oil, gasoline, LNG, naphtha and solvents, acyclic hydrocarbons, benzene and toluene, alcohols, and ammonia. All of these were further investigated for the extent of overpressure based on a confined space vapor explosion. LNG, alcohols, and ammonia, as well as certain types of solvents, were determined to be unable to present a legitimate opportunity for a free vapor cloud explosion due to inherent physical properties – deflagration rate for LNG and solubility in water for the others.

For the confined vapor explosion, none of the commodities evaluated were shown to pose a hazard of an overpressure greater than 1 psi to the site, although the distance to overpressure for gasoline was within 10% of the 1.1 mile standoff distance.

All of the commodities that were evaluated for the free vapor cloud explosion (crude oil, gasoline, naphtha and solvents, acyclic hydrocarbons, benzene and toluene) were determined to pose some level of risk that would have to be evaluated through probabilistic risk assessment (Section H). For these commodities, the length of the river on which the accident could occur to potentially create an overpressure of 1 psi or greater was determined. All "at risk" lengths on the river are less than 3 miles – from 1.5 miles upstream of the plant to 1.5 miles downstream of the plant. This short stretch of river on which barge accidents pose a risk to the plant is considered to be a "safe" section of navigable waterway. Features of the river near the proposed site are discussed further in Section H.

Further, the calculation of the "at-risk" river length incorporates numerous conservatisms. In the case of the confined space analysis, the volume of the largest single barge is used to determine the mass involved in the explosion. The full cargo of the largest single barge is assumed to be involved in the local VCE, taking no credit for the time delay of release from the tank, evaporation rate, or vapor dispersion. The maximum barge size is evaluated even though most barges transported are not 100% filled and many barges' capacity is smaller than the largest barge used in this analysis. No credit is taken for shielding provided by the intervening terrain. No (quantitative) credit is taken for the swift velocity of the river carrying material away from the accident site. All of these factors contribute to a result that is extremely conservative.

## Table F-2. Sensitivity Analysis: Barge Capacity vs. "At-Risk" Length

| | | Crude Petroleum | Gasoline | Naphtha | Acyclic Hydrocarbons: Pentane | Acyclic Hydrocarbons: Acetylene | Benzene | Toluene |
|---|---|---|---|---|---|---|---|---|
| Maximum barge capacity case | | | | | | | | |
| Maximum barge capacity | tons | 4,670 | 5,654 | 5,386 | 4,260 | 4,260 | 3,852 | 4,596 |
| Distance to Overpressure | miles | 1.72 | 1.83 | 1.84 | 1.71 | 1.76 | 1.66 | 1.76 |
| "At Risk" Length | miles | 2.63 | 2.92 | 2.95 | 2.63 | 2.74 | 2.49 | 2.76 |
| 10% Smaller than Maximum Barge Capacity | | | | | | | | |
| Revised Cargo Size | tons | 4,203 | 5,089 | 4,847 | 3,834 | 3,834 | 3,467 | 4,136 |
| Revised Dist to Overpressure | miles | 1.66 | 1.77 | 1.78 | 1.66 | 1.70 | 1.61 | 1.70 |
| Revised "At Risk" Length | miles | 2.48 | 2.76 | 2.79 | 2.47 | 2.59 | 2.34 | 2.60 |
| 20% Smaller than Maximum Barge Capacity | | | | | | | | |
| Revised Cargo Size | tons | 3,736 | 4,523 | 4,309 | 3,408 | 3,408 | 3,082 | 3,677 |
| Revised Dist to Overpressure | miles | 1.59 | 1.70 | 1.71 | 1.59 | 1.63 | 1.54 | 1.64 |
| Revised "At Risk" Length | miles | 2.30 | 2.59 | 2.61 | 2.30 | 2.41 | 2.17 | 2.42 |
| 30% Smaller than Maximum Barge Capacity | | | | | | | | |
| Revised Cargo Size | tons | 3,269 | 3,958 | 3,770 | 2,982 | 2,982 | 2,696 | 3,217 |
| Revised Dist to Overpressure | miles | 1.52 | 1.62 | 1.63 | 1.52 | 1.56 | 1.48 | 1.57 |
| Revised "At Risk" Length | miles | 2.11 | 2.39 | 2.41 | 2.10 | 2.22 | 1.97 | 2.23 |

## G. Evaluation of Vapor Cloud Release and Subsequent Delayed Ignition

The potential for deflagrations in a plume resulting from a barge accident was evaluated using the ALOHA (Areal Locations of Hazardous Atmospheres) computer program, version 5.4, developed jointly by the Environmental Protection Agency and the National Oceanic and Atmospheric Administration (Reference 41). ALOHA models key hazards - toxicity, flammability, thermal radiation (heat), and overpressure (explosion blast force) - related to chemical releases that result in hazardous gas dispersions, fires, and/or explosions.

For each commodity of interest, the vapor dispersion was determined based on a wind speed of 1.55 m/sec, a stability class of D, and a 90°F ambient air temperature. The combination of a high Stability Class, which would be expected during nighttime hours, with a high ambient temperature, which would be expected during daytime hours, is a deliberate conservatism. These meteorological conditions were chosen to maximize the vaporization rate of the commodity of interest while limiting the downwind dispersion.

The release rate from the damaged barge was based on the physical properties of the commodity being transported and two assumed rupture sizes (holes) of 5 $m^2$ and 1 $m^2$. To maximize barge contents releases, the rupture location was assumed to be on the barge bottom, although there is no reasonable mechanism for failure at this location. The most probable accident is a collision which would not likely result in a failure at the bottom of the transport barge.

The proposed ESP site is located adjacent to the river, between mile marker 406 and 407. By inspection of the US Army Corps of Engineers navigational chart (Map 100, Reference 27), the recommended navigation track is a relatively straight course from around marker 404 (to the south of the site) to about marker 409 (to the north). Except for sedimentation control dikes on the west bank (downriver of marker 405), there are no bridges, structures in the river, or other apparent hazards to navigation for this general area within several miles of the ESP site. A review of USCG incident data revealed that there were zero events reported for this particular area of the river. The low incident rate is consistent with these favorable navigational features, such that this immediate area of the river in the vicinity of the ESP site would be expected to have fewer vessel accidents and certainly fewer of those of the scale being considered in this assessment. More specifically, due to these factors, a severe navigational event that would result in a significant breach of the barge's bottom would not be likely. However, to provide maximum release of barge contents, the breach is conservatively assumed on the barge's bottom.

All commodities of interest were assumed to be at ambient temperature (90°F) except for cryogenic liquids (Methane, Ethane, Ethylene, and Propane which are stored at their normal transport temperature. The assumed release is into the river water, with an assumed water temperature of 83°F (the average mean temperature for July for 1988-92 for the lower Mississippi River at New Orleans), surrounding the damaged barge (Reference 43). This is conservative since the peak river water temperature will produce increased vaporization. No credit is taken for the downstream dispersion of the release due to river flow, which would reduce the plume concentration at the site. Commodities of interest that are soluble in water were not evaluated since the release into the river would not result in a downwind plume. In the ALOHA model, chemicals that escape as a gas or two-phase liquid do not use a surface heat source. The release and consequence evaluation were terminated at 1 hr by the ALOHA code since the atmospheric conditions are not expected to remain constant for a longer duration.

As before, the maximum barge capacity data for each commodity was obtained from WCSC Pass–the-Point data reports as given below:

| Chemical | Max Barge Capacity(tons) |
|---|---|
| Gasoline | 5,654 |
| Methane | 4,850 |
| Ethane | 4,850 |
| Ethylene | 4,850 |
| Propane | 4,850 |
| Naphtha | 5,386 |
| Acetone | 5,386 |
| Pentane | 4,260 |
| Acetylene | 4,260 |
| Benzene | 3,852 |
| Toluene | 4,596 |
| Methanol[1] | 5,654 |
| Ethanol[1] | 5,654 |
| Ammonia | 2,902 |

[1]Assumed to be the same capacity as gasoline

Acetone, Methanol, and Ethanol are not considered for plume generation since they are water-soluble. In addition, the possibility of a detonation of LNG was not considered credible. (See Attachment 2.)

The results from the atmospheric dispersion and overpressure evaluations are given Tables G-1 and G-2.

### Table G-1: Leakage from Assumed 5 m² Hole

| Chemical | LEL (ppm) (Note 3) | Pool Diameter | Distance to LEL | Concentration at site (ppm) | Overpressure at site (psig) |
|---|---|---|---|---|---|
| Gasoline (n-heptane)[1] | 10,000 | 1.1 mi | 1.3 mi | 12,000 | 0.517 |
| Methane | 44,000 | 311 yards | 818 yards | 11,900 | 0.177 |
| Ethane | 29,000 | Note 2 | 2.9 mi | 505,000 | 0.953 |
| Ethylene | 23,000 | 384 yards | 2.4 mi | 94,000 | 0.953 |
| Propane | 20,000 | 490 yards | 2.4 | **69,300** | 0.953 |
| Pentane (n-pentane) | 13,000 | 1049 yards | 2.3 mi | 66,200 | 0.953 |
| Acetylene | 25,000 | Note 2 | 1567 yards | 16,100 | 1.38<br>(0.971 psi at 1.25 mi.) |
| Benzene | 12,000 | 1284 yards | 1.2 mi | 11,300 | 0.364 |
| Toluene | 12,000 | 1450 yards | 693 yards | 2,450 | 0.0 |
| Ammonia | 160,000 | Note 2 | 1031 yards | 43,600 | 0.15 |
| Naphtha[4] | 10,500 | 1502 yards | 1.9 mi | 29,000 | 0.953 |

[1]n-heptane is used as a substitute for gasoline since the molecular weight (100gm/mol) and physical properties are similar to that of gasoline.
[2]Two-phase flow release
[3]The LEL values listed are from the ALOHA code
[4]Naphtha is not listed in the ALOHA library since it is not a "pure" chemical. Therefore n-Hexane is used as a substitute since it is on the light end of naphtha

### Table G-2: Leakage from Assumed 1 m² Hole

| Chemical | LEL (ppm) (Note 3) | Pool Diameter | Distance to LEL | Concentration at site (ppm) | Overpressure at site (psig) |
|---|---|---|---|---|---|
| Gasoline (n-heptane)[1] | 10,000 | 1342 yards | 1674 yards | 3,880 | 0.204 |
| Methane | 44,000 | 150 yards | 409 yards | 7,050 | 0.0 |
| Ethane | 29,000 | Note 2 | 2.1 mi | 174,000 | 0.953 |
| Ethylene | 23,000 | 202 yards | 2.0 mi | 65,400 | 0.953 |
| Propane | 20,000 | 283 yards | 1.9 | **48,300** | 0.953 |
| Pentane (n-pentane) | 13,000 | 927 yards | 2.0 mi | 53,500 | 0.953 |
| Acetylene | 25,000 | Note 2 | 1.1 mi | 26,300 | 3.45<br>(0.97 psi at 1.45 mi.) |
| Benzene | 12,000 | 1069 yards | 1709 yards | 4,900 | 0.199 |
| Toluene | 12,000 | 1133 yards | 509 yards | 1,320 | 0.0 |
| Ammonia | 160,000 | Note 2 | 1185 yards | 74,900 | 0.161 |
| Naphtha[4] | 10,500 | 885 yards | 1.2 mi | 8,180 | 0.28 |

[1]n-heptane is used as a substitute for gasoline since the molecular weight (100gm/mol) and physical properties are similar to that of gasoline.
[2]Two-phase flow release
[3]The LEL values listed are from the ALOHA code
[4]Naphtha is not listed in the ALOHA library since it is not a "pure" chemical. Therefore n-Hexane is used as a substitute since it is on the light end of naphtha

Commodities of interest which have concentrations at the site above the Lower Explosive Limit (LEL) or which produce an overpressure greater than 1.0 psi at the site required an additional risk assessment analysis to demonstrate compliance with the referenced regulatory guidance documents. Based on the results in Table G-1 and G-2, the following commodities required additional risk assessment:

Acetylene - overpressure at the proposed site exceeding 1.0 psi

Gasoline, LNG components (Ethane, Ethylene, Propane), Pentane, Acetylene, Benzene, and Naphtha - plume length (distance to LEL) consideration

This risk assessment is addressed in Section H.

## H. Risk Assessment

1. Historic Experience

In order to affect a facility over a mile away, a very large explosion is required. Historically, large explosions have occurred in shipping and petroleum facilities. The Port Chicago explosion of 7/17/1944 killed 320 men when a WWII ammunition ship exploded while being loaded on the Sacramento River. The explosive equivalent was 1750 tons of TNT (Reference 28). However, transportation safety practices have improved greatly since then. Even by the standards of 1944, the practices at Port Chicago were unsafe. The 1750-ton TNT equivalent explosion of Port Chicago explosion generated missiles out well over 1 mile. The mention of this event in the context of the current risk assessment for the ESP site is to stress the rarity of accidental explosions of this magnitude. Calculations show that approximately 1000 ton TNT-equivalent detonations result in an incident overpressure at 1.1 miles from the river of greater than one psi.

A similar event was recorded in 1947, when a Liberty Ship containing ammonium nitrate, exploded at Texas City (Reference 33). This explosion was estimated at 2000 to 4000 tons-TNT equivalent. This explosion killed 581 people with thousands more injured. While this does present an example of a very large explosion, it is believed to be a result of practices that are not relevant to modern marine transportation.

The Handbook of Fire And Explosion Protection Engineering Principles For Oil, Gas, Chemical, And Related Facilities (Reference 29) states:

> In reviewing accident histories, remember that the technology and operating practices employed in earlier decades have changed tremendously to the current date and are likely to do so in the future. The latest control technology continuously improves operating practices and may also lower manpower requirements. In practice only the last ten years or so of loss histories are generally examined for relevancy to the current operating environments of most hydrocarbon facilities.

1.1 Chronology of Major Petroleum Fires and Explosions

Reference 29 contains a chronology of major petroleum fires and explosions. Virtually all of these occurred on drilling platforms, within processing facilities, or at loading docks. In reverse order, the events from the latest 10 years recorded can be classified as follows:

1994: Boiling liquid/expanding vapor explosion (BLEVE) at dockside loading facility, Lake Maracaibo, Venezuela
Three chemical plant explosions (1 in USA)
One Refinery Fire
One drilling platform lost due to a ship collision offshore Egypt
One fatality on the Mississippi River when a barge ruptured a gas pipeline
1993: Six refinery fires and explosions (two in USA, including a Baton Rouge refinery explosion 8/2/93 that killed 3 employees)
Pipeline fire in Venezuela
Offshore drilling rig fire in Venezuela
1992: A vapor cloud explosion at Brenham, Texas killed 1. This event is "perhaps the most spectacular" of vapor cloud explosions formed from leaking natural gas. It is estimated to have been the equivalent of 20 tons of TNT (Reference 30)
1991: Nine process plant explosions or fires (5 in US, including 2 in Louisiana)
1990: Eight process plant explosions or fires (5 in US)
1989: One blowout in a drill rig
One pipeline explosion in Russia
Six process plant explosions or fires
Mid-ocean (offshore the Canary Islands and Morocco) tanker explosion in the Iranian tanker Kharg-5 (apparently caused by ignition of hydrocarbon vapors that accumulated in a ballast tank during a storm). This explosion was large enough to open the side of the vessel and initiate a large oil spill, but there were no fatalities. The ship itself had seen war service and had been damaged in three attacks. (Reference 31)
1988: Four Offshore Platform explosions or fires (2 Gulf of Mexico)
Five process plant explosions or fires (3 in the US), including a Port Arthur, Texas, 6/8/88 propane vapor cloud explosion
1987: One Offshore Platform explosion or fire (Gulf of Mexico)
Two process plant explosions or fires (1 in the US)
1986: One process plant explosion/fire, and one explosion at an oil drill site.
1985 Two process plants explosion/fire (1 in the US)
Two terminal explosion/fires (1 in the US)

These events are from a 1996 source, but refinery explosions have continued. On 12/11/2005, an explosion at the Hertfordshire Oil Storage terminal damaged buildings up to a half-mile away in what some consider to be the largest explosion in Europe since WWII (Reference 32). On 3/24/2004, a BP refinery explosion in Texas killed 14.

A particularly bad explosion occurred at the Vishakhapatnam refinery in India 9/14/97. Despite detection, a leak of LPG was allowed to continue unrepaired for over an hour. The vapor cloud eventually ignited, and caused a partially-filled storage tank to explode, setting off a chain of fires and explosions that eventually involved 25 storage tanks and 60 fatalities. The largest explosion (BLEVE) in the chain had an explosive energy release, calculated by Pondicherry University, of $2.3x10^9$ KJ which is 540 tons TNT equivalent. (Reference 34)

Also, accidents have occurred at defense or space related facilities such as the Pepcon facility in Henderson, Nevada, 5/4/1988. However, these are not as relevant to Mississippi River traffic.

1.2 Summary of Worldwide Marine Explosion (Since ~1971)

A summary of worldwide marine explosions or fires, other than in port accidents related to loading or offloading, are as follows (drilling barges excluded), from Reference 29. These include incidents listed above for 1989 and 1994.

- 1/11/1971: English Channel, Natural Gas Tanker, Explosion/Fire. Ship collided with another vessel, 8 Fatalities, Tanker sank
- 1/21/71: Mediterranean Sea, Oil Tanker, Fire/Explosion, 39 Fatalities
- 5/11/72: Atlantic Ocean, Oil tanker, Fire Vessel collided with another in fog and fire erupted, 83 fatalities, vessels total loss
- 8/21/72:Atlantic Ocean, Oil Tanker, Explosion/Fire. Vessel collided with another in fog and explosion occurred, 50 Fatalities
- 3/30/73: Hong Kong Harbor, Oil Tanker, Fire. Vessel collided with another and fire ensued. 3 Fatalities
- 11/11/74: Tokyo Bay, Japan, Gas Tanker, Explosion/Fire. Liquefied tanker vessel collided with freighter, 33 Fatalities, Tanker sunk.
- 1/31/75: Marcus Hook, PA, USA, Tanker, Explosion/Fire. Tanker was rammed by a chemical tanker vessel which lost control. $7,837,000 loss
- 2/24/77: Pacific Ocean, Tanker, Explosion/Fire. Tanker structural failure. 1 Fatality, 846 foot Tanker was a total loss and 30 million gallons of oil. Two crude oil supertankers (each 330,000 dwt.) collided and fire occurred. Fires extinguished and vessels salvaged.
- 7/19/79: Caribbean Ocean, Supertanker, Collision/Fire. Two fully loaded crude oil supertankers collide. 1 fatality, Loss estimated at $150 million
- 8/30/79: Good Hope, LA, USA, Barge, Fire. Cargo ship collided with barge rupturing butane storage that ignited. $10,500,000 loss
- 8/21/80: Gulf of Mexico, Eugene Island 361A, Fire. 20,000 dwt. gasoline tanker collided with unmarked recently installed jacket. Severe damage to vessel and jacket.
- 12/19/89: Offshore Las Palmas, canary Islands, Tanker, Explosion. Explosion opened tanker hull and spilled 19 million gallons.

- 1/ 7/94: Mississippi River, USA, Drilling Barge, Ruptured Pipeline. Drill barge spudded into gas pipeline. 1 Fatality

### 1.3 Conclusions from Historic Records Review

The conclusions that can be drawn from the historic record are:

(1) Since a 1000 ton-TNT explosion would have consequences similar to the Port Chicago explosion with a loss of all shipboard personnel, it is concluded that the above explosions were well under 1000 ton-TNT equivalent. Accidental explosions of the type evaluated for the ESP site of greater than 1000 tons TNT-equivalent have not occurred at any commercial hydrocarbon facility or transport operation in the world in the past 35 years.

(2) Vessel collisions with fires and explosions have greatly decreased since the 1970s, and safety improvements have virtually eradicated such events. The only major tanker explosion since the 1970s was an Iranian oil tanker that was of questionable safety after its involvement in the Iran-Iraq war, and the explosion which occurred was minor in terms of potential effects at the same distance that the ESP site is from the Mississippi River. Note that NUREG/CR-6624 also identifies a trend towards lower marine transportation accidents and fatalities from the 1970s to 1990s.

(3) Explosions do occur at an unfortunate frequency involving vapor clouds and causing fatalities; however, the worst energy content explosion even at refineries is on the order of 540 tons TNT-equivalent, which is insufficient to have adverse consequences at the distance that the ESP site is located from the Mississippi River. The "most spectacular" vapor cloud explosion identified was on the order of 20 tons TNT-equivalent.

The 35-year global experience of zero accident events sufficient to have adverse consequences at a distance equal to that of the Mississippi River to the ESP site shows that the probability of a significant event at the ESP site is extremely remote.

## 2. Spill and Collision Frequency on the Mississippi River

### 2.1 Spill Frequency Assessment

To calculate the spill frequency, the USCG databases were consulted. In this database, the spill location is identified by name, latitude, and longitude. The database identifies 5,687 spill reports for all U.S. waters. To reduce these to only events applicable to the ESP site, the data was screened to remove duplicate records and all events that did not occur on the Mississippi River. The remaining events were further screened by the type of spill. Spills that were excluded were bilge slops, chlorine, coconut oil, diesel (the largest spill type), lubricating oil, mineral oil, molasses, motor oil, palm oil, hydraulic fluid, sunflower oil, and waste oil. This resulted in 255 spill events on the Mississippi, or its feeder rivers, during the interval from 12/2001 through 12/2005 (4 years, 1 month).

The total river length is taken to be 2500 miles. This includes 2300 for the Mississippi per the USGS (Reference 35) and a bounding low value of 200 miles for the Ohio and other feeder rivers. Hence the spill rate per river mile per year is 255/(4.083*2500) = 0.025 spills/mile-yr. Note that it is conservative to apply this general rate to the area around the ESP site, since the ESP site has no particular obstacles such as bridges or major terminals (see Figure H-1) in the immediate vicinity on the river, while other areas with such obstacles presumably have higher incident rates. (See also Mississippi River Chart, Map 100, Reference 27.)

Figure H-1: Mississippi River by the ESP site (view generally looking from East to West)

The 255 spills were binned by size to give the following data. Here the mass in units of tons is calculated based on a specific gravity of 0.9 based on the fact that the fluid must float to produce a vapor cloud and explosion risk. The calculated spill mass (tons) is determined as follows:

$$\frac{\text{Midpoint volume(gal)}}{7.481\ \frac{\text{gal}}{\text{ft}^3}} * 62.4\ \frac{\text{lbm}}{\text{ft}^3} * 0.9 * \frac{\text{ton}}{2000\ \text{lbm}}$$

The frequency per year is the total number of events in each spill size category divided by the time period of 4.0833 years.

**Table H-1: Spill Frequency Data from MISLE (Reference 37)**

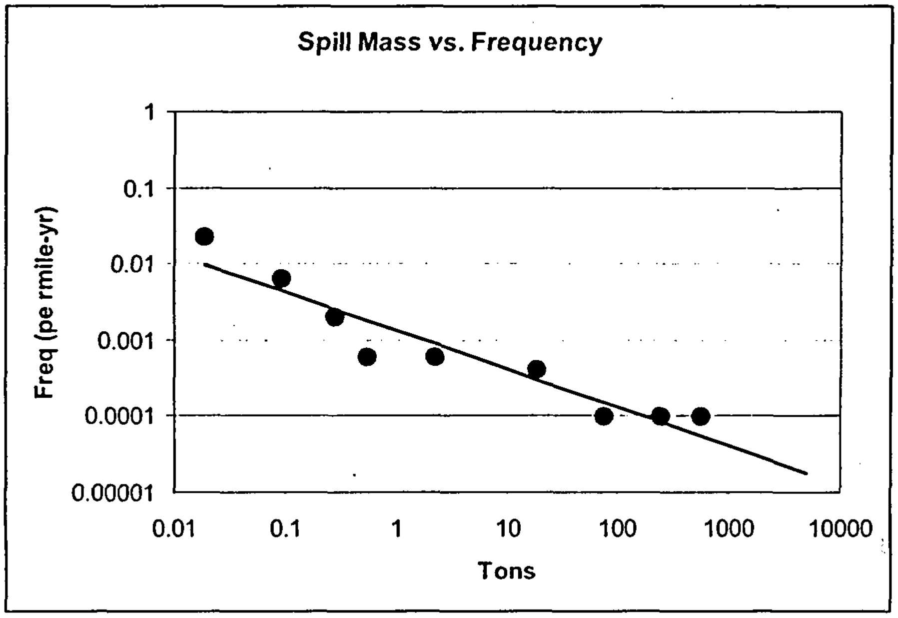
| Spill size (gals) | Midpoint (gals) | Tons | Number | Frequency (per mile-yr) |
|---|---|---|---|---|
| <10 | 5 | 0.018768 | 152 | 0.01489 |
| 10-49 | 25 | 0.093838 | 64 | 0.006269 |
| 50-99 | 75 | 0.281513 | 20 | 0.001959 |
| 100-199 | 150 | 0.563026 | 6 | 0.000588 |
| 200-999 | 600 | 2.252105 | 6 | 0.000588 |
| 1000-9999 | 5000 | 18.76754 | 4 | 0.000392 |
| 10,000-29,999 | 20000 | 75.07018 | 1 | 9.8E-05 |
| 30,000-99,999 | 65000 | 243.9781 | 1 | 9.8E-05 |
| 100,000-200,000 | 150000 | 563.0263 | 1 | 9.8E-05 |
| >200,000 | | | | |

The spill mass (tons) and the frequency were plotted and a curve fit made. A linear curve fit was made to the log-log chart, giving the final form:

$$\text{Freq (per mile-yr)} = 10^{(-0.5027*\text{LOG(tonnage)}-2.879)} \quad \textbf{[Eq. 1]}$$

This curve fit is illustrated in Figure H-2.

**Figure H-2: Spill Frequency of Combustible Material on the Mississippi River, 2001 – 2005**



A check was made using the U.S. Coast Guard Marine Safety Management System[7] (MSMS) database of spills for the nine years 1992 to 2001 (Reference 38). The above development implies that 100,000-gallon spills (3000 tons at 0.72 s.g.) should occur at a frequency of 0.000024/mile-yr. Multiplying by 2300 miles of river and 9 years, this implies zero or one such large spills should be in the database (the predicted number is actually 0.5). A search revealed a total of 47 spills of 100,000 gallons or larger in US waters, but only four were on the Mississippi River and none of these were from vessels (all were facility discharges). Thus, the prediction of zero or one in this period agrees with the evidence of zero.

A review of the MSMS database and consideration of the methodology used to develop the spill frequency identifies the following conservatisms and non-conservatisms:

1. All unspecified spills or unknown oils are treated as combustibles and potential explosion sources (conservative).
2. Spills without specified spill volume are binned into less than 10 gallons, amounting to 10 spills out of the 255. This is non-conservative since these spills may have been greater than 10 gallons, but reasonable as larger spills would likely have their amounts noted. Also, most of these are unspecified material (6) or unspecified oil types (3) and likely not potential explosives at all.
3. There may be releases that failed to get captured in this database. However, these would be minor and not involve explosions, or the significance of the event would make it noted.
4. The proposed ESP site is located adjacent to the river, between river mile marker 406 and 407. The river is a relatively gentle bend from around marker 404 (to the south of the site) to about marker 409 (to the north). Except for sedimentation control dikes on the west bank (downriver of marker 405), there are no bridges, structures in the river, or other apparent hazards to navigation for this general area within several miles of the proposed site. (See Figure H-1 and Mississippi River Chart, Map 100, Reference 27.) The nearest bridges are at Vicksburg and Natchez. A review of USCG incident data (MISLE database) revealed that there were no spill events reported for this particular area of the river (between N. Lat 31°59' to 32°03') in the last 4 years.
5. A further conservatism is applied below, when all these spills are assumed to be associated with the seven critical cargo types and apportioned among them according to total river traffic volume.

The above methodology based on spill frequency provides an upper bound on the frequency of a large release at the ESP site. As a check, an estimate of the frequency of collisions at the ESP site was determined.

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[7] The USCG MSMS is a precursor to the MISLE database and information management system.

## 2.2 Comparison of Spill Frequency with Collision Incident Information

The type of explosions necessary to generate an overpressure of 1-psi at the ESP site involve near full release of the cargo and subsequent mixture with air in a detonable ratio. As a practical matter, the only event likely to generate this scenario at this location is a significant vessel-to-vessel head-on collision, since there are no bridges or similar allision hazards and there are no cross-traffic flows. A review of the MISLE database (Reference 37) reveals 1083 collision events. These are pared down by removal of "crossing" types and "undamaged" results to 586 collisions in U.S. waters. Only 5 are identified as "total loss," and none of these were on the Mississippi. There were 6 events with "unspecified" under damage result, but these were all in the Gulf of Mexico. The remaining 575 events were evaluated as the spills were above, resulting in 144 events after paring by latitude and longitude ranges, and removing duplicate records. These 144 event were individually reviewed to find a total of 92 collisions on the Mississippi or feeder rivers in these 4.083 years, or a collision frequency of about 92/(2500miles*4.083) = 0.009 collision/river-mile-yr.

This number must be reduced by the fraction of collisions involving barges carrying hazardous material of sufficient size to be a concern, and by the fraction of collisions resulting in loss of sufficient cargo to create an explosion hazard. The first term can be estimated by noting that the hazardous cargo shipments past the ESP site amount to about 5 million tons a year (from Table H-3, excluding distillate fuel oils) whereas total Mississippi River traffic amounts to 196 million tons/yr (Reference 16). It is conservative to use a value of 5/196*(2/3)= 0.017 for this factor since many of the collisions would have involved non-cargo ships, and since the traffic is roughly twice as heavy near the mouth of the Mississippi as compared to the ESP site. (The ratio of accidents nearer the mouth of the Mississippi River of 2/3 is verified by noting in the data that 63 of the 92 collisions occurred south of latitude N 31°). The second factor is very difficult to assess, but an order of magnitude (0.1) is judged to be reasonable, since few collisions will be serious enough to cause a full loss of all contained cargo. Thus the collision frequency works out to be 0.009 * 0.017 *0 .1 = $1.5x10^{-5}$/mile-yr. By the spill development above, this is the same frequency as 7100 ton spills, that is, $1.5x10^{-5} = 10^{(-0.5027*LOG(7100)-2.879)}$. Since all the spills considered here are less than 7100 tons, it is more conservative to use the spill frequency relation than the collision rate calculation.

## 3. Risk Assessment, Detonation

The overall risk is calculated based on the series of events that must occur in order for a very large explosion to impact the ESP site. The events are that a barge carrying detonable material passes by the site, has a significant accident that releases its detonable material to mix with air, an ignition occurs resulting in an explosion, and the explosion is large enough to impact the ESP site more than a mile away. The accident risk is the product of the risk of a spill per river-mile and the distance that the barge travels within range of the site.

The risk formula is:

Risk = f(spills/mile-yr)*L(miles)*P(explosion|spill)

This calculation is performed for the following seven commodities: crude petroleum, gasoline, naphtha, pentane and acetylene (acyclic hydrocarbons), benzene and toluene. As discussed in Section F, these materials were analyzed for maximum detonation overpressure with potential adverse impact on the ESP site (that is, having a distance to a 1 psi overpressure greater than 1.1 miles). The important inputs to this analysis are the maximum barge size based on USACE records (Section E) for this location on the Mississippi River, and a conservative treatment of the material properties, with the very conservative assumption of full detonation of all contained combustibles (in a single, maximum capacity barge).

The length of river on which the accident could occur to potentially create an overpressure of 1 psi or greater is the "at-risk" river length. The at-risk lengths are presented in Table F-2 (with a sensitivity analysis for cargoes less than the maximum barge capacity.

Shipping information was collected and analyzed for these materials. A summary is presented in Table H-2, including percentage of total mass and total trips. The family of distillate fuel oils (DFO) is included in Table H-2, since this commodity was also initially considered as an explosion or plume risks. As discussed in Attachment 2, DFOs were later screened out of the consequence calculations due to low volatility. However, DFOs are included here for the purpose of assessing spill frequency, since they increase the database size and therefore the accuracy of spill frequency projections. But their impact is effectively cancelled when multiplying the spill frequency times the percent cargo mass of Table H-3. That is, by including DFOs, the spills per mile rate increases in a conservative fashion. Yet when calculating the spill frequency for a particular commodity like gasoline, the higher spill frequency is multiplied by a lower percentage total mass.

**Table H-2: Shipping Data from USACE Records**

| Year | Commodity | Max. Barge Capacity (CAP_TONS) | Total TRIPS | Total TONS | Avg. TONS/TRIP | % total mass | % total trips |
|---|---|---|---|---|---|---|---|
| 2003 | Gasoline | 5654 | 1109 | 2974473 | 2682 | 34.5% | 34.6% |
| 2003 | Distillate Fuel Oil | 5654 | 1207 | 3340011 | 2767 | 38.8% | 37.7% |
| 2003 | Naphtha & Solvents | 5000 | 207 | 500450 | 2418 | 5.8% | 6.5% |
| 2003 | LNG | 4850 | 85 | 92298 | 1086 | 1.1% | 2.7% |
| 2003 | Benzene | 3852 | 35 | 57271 | 1636 | 0.7% | 1.1% |
| 2003 | Toluene | 2400 | 20 | 30038 | 1502 | 0.3% | 0.6% |
| 2003 | Ammonia | 2902 | 294 | 731960 | 2490 | 8.5% | 9.2% |
| 2003 | Acyclic Hydrocarbons – NEC (Pentane & Acetylene) | 4260 | 14 | 8585 | 613 | 0.1% | 0.4% |
| 2003 | Crude Petroleum | 4670 | 231 | 874953 | 3788 | 10.2% | 7.2% |
| 2004 | Gasoline | 4850 | 806 | 2062837 | 2559 | 26.0% | 27.1% |
| 2004 | Distillate Fuel Oil | 5029 | 1088 | 2952750 | 2714 | 37.1% | 50.2% |
| 2004 | Naphtha & Solvents | 5386 | 315 | 842406 | 2674 | 10.6% | 7.8% |
| 2004 | LNG | 3891 | 71 | 89027 | 1254 | 1.1% | 1.9% |
| 2004 | Benzene | 3500 | 31 | 53055 | 1711 | 0.7% | 0.8% |
| 2004 | Toluene | 4596 | 41 | 81989 | 2000 | 1.0% | 1.1% |
| 2004 | Ammonia | 2902 | 317 | 787952 | 2486 | 9.9% | 8.8% |
| 2004 | Acyclic Hydrocarbons – NEC (Pentane & Acetylene) | 4260 | 9 | 12919 | 1435 | 0.2% | 0.3% |
| 2004 | Crude Petroleum | 4670 | 296 | 1066176 | 3602 | 13.4% | 9.1% |

To be conservative, the proportion of spills associated with each cargo type is made based on the maximum of the associated four percentage values. For example, in 2003, gasoline shipments composed 34.5% of the volume and 34.6% of the trips. In 2004, it composed 26% of the volume and 27.1% of the trips. Therefore it is assumed that the portion of spills on the Mississippi that are gasoline is the maximum of these, or 34.6%. This is conservative since this approach totals more than 100%, effectively increasing the spill frequency above that calculated before. The result is given in Table H-3.

**Table H-3: Percentage of Traffic by Material**

| | |
|---|---|
| Gasoline | 34.6% |
| Distillate Fuel Oil | 50.2% |
| Naphtha & Solvents | 10.6% |
| LNG | 2.7% |
| Benzene | 1.1% |
| Toluene | 1.1% |
| Ammonia | 9.9% |
| Acyclic Hydrocarbons – NEC (Pentane & Acetylene) | 0.4% |
| Crude Petroleum | 13.4% |

The frequency of spills for each commodity is the result of Equation 1 multiplied by the commodity's percentage of mass; for example, the frequency of gasoline spills is $0.346*10^{(-0.5027*LOG(tonnage)-2.879)} = 5.9E\text{-}06$. This determines the value of "f" in the risk equation:

Risk = f(spills/mile-yr)*L(miles)*P(explosion|spill)

The frequency of spills "f" is dependent on the assumed mass and decreases as mass increases. However, the path length "L" is dependent on mass and increases as mass increases. To seek the worst case, the product of "f*L" is calculated for the 7 cargo types assuming both the maximum barge size and 70% of the maximum size.

**Table H-4: Development of f*L Term, Cargo Size Sensitivity**

| | % total spills | Max barge size (tons) | f (/mile-yr) | L (mile) | Prod f*L (/yr) | 70% size | f (/mile-yr) | L (mile) | Prod f*L (/yr) | Trips per yr | Trips 2003 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Gasoline | 34.60% | 5,654 | 5.94E-6 | 2.92 | 1.73E-05 | 3958 | 7.11E-6 | 2.39 | 1.70E-5 | 752 | 1109 |
| Crude Petroleum | 13.40% | 4,670 | 2.53E-6 | 2.63 | 6.66E-06 | 3269 | 3.03E-6 | 2.11 | 6.39E-6 | 268 | 231 |
| Naphtha & Solvents | 10.60% | 5,386 | 1.86E-6 | 2.95 | 5.50E-06 | 3770 | 2.23E-6 | 2.41 | 5.38E-6 | 133 | 207 |
| LNG | 2.70% | no risk [1] | . | . | | . | . | . | | . | . |
| Distillate Fuel Oil | 50.20% | no risk [1] | . | . | | . | . | . | | | . |
| Ammonia | 9.90% | no risk [1] | . | . | | . | . | . | | . | . |
| Acyclic Hydrocarbons - NEC (Pentane and Acetylene) | 0.40% | 4,260 | 7.92E-8 | 2.74 | 2.17E-07 | 2982 | 9.47E-8 | 2.22 | 2.10E-7 | 3 | 14 |
| Benzene | 1.10% | 3,852 | 2.29E-7 | 2.49 | 5.70E-07 | 2696 | 2.74E-7 | 1.97 | 5.40E-7 | 21 | 35 |
| Toluene | 1.10% | 4,596 | 2.10E-7 | 2.76 | 5.78E-07 | 3217 | 2.51E-7 | 2.23 | 5.59E-7 | 9 | 20 |

Note 1: The no-risk determination is based on material properties and maximum detonation being below the TNT-equivalent to impact the ESP site at 1.1 miles distance.

The f*L columns in Table H-4 show that the two offsetting effects make the results insensitive to the assumed cargo size. The spills of smaller cargoes are roughly 20% more likely, but the "at-risk" path length is roughly 20% shorter.

The column labeled trips per year is the 2003 total tonnage divided by the "70% size" mass. When this is compared to the actual number of 2003 trips, it is seen in most cases that the number of 70% maximum barge trips is similar to the actual number of trips. In practice, much of the annual hazardous cargo volume may travel in sizes too small to impact the ESP site, but no credit is taken for this.

The remaining term in the risk equation is the probability that if the cargo contents are spilled, they are all involved in a detonation. This is a difficult term to quantify. The process involves both perfect mixing of all the fuel with oxidant (air) prior to combustion or dispersion, followed by an ignition source. Thus while these detonations are theoretically possible on an energy basis, in practice they simply do not occur. As noted above in the review of the historic records, even at refineries over the past 35 years, the maximum explosive force that has been achieved accidentally through vapor/air mixture and combustion via BLEVE, is on the order of 540 tons-TNT, which is insufficient to impact the ESP site at a distance of 1.1 miles. By comparison, the TNT equivalents listed to generate the "at-risk" path lengths above approach 5000 tons-TNT (the distance to 1-psi is 45 ft*(TNT lbm)$^{1/3}$ = 45*(5000 tons * 2000 lbm/ton)$^{1/3}$ = 1.84 miles. The corresponding at-risk path length along the river would be $2*(1.83^2 - 1.1^2)^{0.5}$ = 2.94 miles.

Of the 255 spills identified above in the MISLE database (Reference 37), none is associated with an explosion. That may not necessarily be a conservative rate (0 explosions in 255 spills) since some events may be recorded as explosions that were first spills, and 128 of the spills involved non-explosive DFO. A review of all the explosions in US waters in the MISLE database indicates that four occurred on the Mississippi or Ohio Rivers in this period. However, only one was a BLEVE; the other three are described as "incendiary explosions." Common causes of explosions on board vessels are events such as sparks igniting vapors; but these are incapable of causing the full vessel contents to explode due to limitations of air exposure. Therefore a first cut value at explosions given a spill is to assume the one remaining event, the BLEVE of 11/28/2000 at Port Sulfur, LA, was associated with a spill. In that case, the explosion per spill frequency in this database is 1/(256-128) = 0.008 explosions/spill. However, there is no evidence that all the fuel detonated. Therefore this value is decreased by an order of magnitude to 0.0004 full content explosions per spill. This order of magnitude decrease is considered conservative since:

1. the volumes of spill are remarkably large (4000 tons of gasoline is equal to around 700,000 gallons) and will take time to empty,
2. during that period of time, any ignition would decrease the combustibles while (from the perspective of the distant ESP site) doing no harm, and
3. during that period of outflow, the river currents will remove much of the liquid, and the air currents will remove much of the vapor.

The last point concerning air currents is why examples of vapor cloud detonations are limited to the order of 20 tons-TNT equivalent in refinery events, even though the potential thermal energy stored in a refinery is much greater (Reference 30).

Use of the value of P(full content explosion given a spill) = 0.0008 gives the final solution to the risk equation in Table H-5.

**Table H-5: Accidental River Detonation Risk to ESP site**

| Commodity | Prod f*L ($yr^{-1}$) | P | Risk ($yr^{-1}$) |
|---|---|---|---|
| Gasoline | 1.73E-05 | 0.0008 | 1.39E-08 |
| Crude Petroleum | 6.66E-06 | 0.0008 | 5.33E-09 |
| Naphtha & Solvents | 5.50E-06 | 0.0008 | 4.40E-09 |
| Acyclic Hydrocarbons – NEC (Pentane and Acetylene) | 2.17E-07 | 0.0008 | 1.74E-10 |
| Benzene | 5.70E-07 | 0.0008 | 4.56E-10 |
| Toluene | 5.78E-07 | 0.0008 | 4.63E-10 |
| Total | | | 2.47E-08 |

Conclusion to Detonation Risk Assessment

The results of the detonation risk assessment show the extremely low risk value of 2.5E-8. That is not surprising considering the immense size of the explosion necessary to cause adverse consequences at the ESP site at a distance of over 1 mile from the Mississippi River, and the very small length of river available for the explosion to occur and cause such an impact.

To understand the conservative nature of the final results, it should be considered that the full length of the Mississippi River is 2500 miles (i.e., only ~3 miles are considered at risk), and its traffic is consistent with other major waterways around the world, and safer than ocean-going traffic (in terms of large spill frequency and large cargo sizes). Moreover, the risks onboard a river vessel, where no activity is occurring with the potential combustibles, is much lower than the risks associated with process plants. The fact that no accidental explosions of the immense sizes required have ever occurred in a commercial venture anywhere in the world, make it understandable that the explosion risk at a short stretch of the relatively calm, soft-bottomed Mississippi River is insignificantly small.

4. Risk Assessment, Plume Drift

The analysis of potential plume formations and delayed ignition effects is discussed in Section G. Based on the results in Tables G-1 and G-2, the following commodities required additional risk assessment based on potential plume length considerations: Gasoline, LNG components (Ethane, Ethylene, Propane), Pentane, Acetylene, and Benzene.

The risk of plumes drifting to the ESP site resulting from spills is primarily a fire risk and a local site detonation risk. Events have occurred wherein clouds of vapor gases have drifted and become contained, and subsequently exploded. On October 20, 1944, a LNG tank at the Ohio Gas Company leaked vapors that gathered in the sewer system below the streets of Cleveland. The subsequent series of explosions killed over 100 people.

An earlier risk assessment performed specifically for LNG spills on the Mississippi River near the ESP site (Reference 14) concluded that the risk of a plume could be quantified as follows:

f(ship) = 16.3 ship-miles/yr (based on LNG traffic)
P(accident|ship)*P(release|accident) = $3x10^{-8}$ release/ship-mile
P(correct met conditions) = 0.06
P(ignition) = 1.0

Therefore, by the following equation:

Risk = f(ship)*P(accident|ship)*P(release|accident)*P(correct met conditions)*P(ignition)

the risk is numerically equal to:

$$\text{Risk} = 16.3 * 3\text{x}10^{-8} * 0.06 * 1.0 = 3\text{x}10^{-8}\ \text{yr}^{-1}$$

This calculation was identified as extremely conservative. Key conservatisms are that the leak probability P(accident|ship) was based on:

1. Older data (1981)
2. All spills were considered; no credit was given for safer ships hauling hazardous materials
3. No consideration was given for the size of release.

The assessment performed for the detonation risk assessment above is based on the most recent four years experience, is limited to spills of the more hazardous types, and produces a spill frequency as a function of volume spilled. The final results are repeated in Table H-6.

**Table H-6: Frequency of Spills Times At-Risk Lengths Determined for Detonation**

| Commodity | Prod f*L ($yr^{-1}$) |
|---|---|
| Gasoline | 1.73E-05 |
| Crude Petroleum | 6.66E-06 |
| Naphtha & Solvents | 5.50E-06 |
| Acyclic Hydrocarbons - NEC (Pentane and Acetylene) | 2.17E-07 |
| Benzene | 5.70E-07 |
| Toluene | 5.78E-07 |
| Total | 3.09E-05 |

Although the new numbers appear greater, they are actually less conservative than the previous assessment. To compare, one would take the previous value of $3x10^{-8}$/ship-mile (Reference 14) and multiply by the number of hazardous cargo trips/yr (3000) (Table E-1) and the at-risk length of about 3 miles to generate a total value of $2.7 \times 10^{-4}$, or 9 times greater than the current study. This factor of 9 is justified by the more accurate use of hazardous cargo spills only, thirty-five years of improvements in preventing spills, and recognition that the large spills required to create these plumes are more rare than small spills.

The plume lengths that are predicted before the gas concentration falls below the lower flammability limit are as follows for an assumed 5 $m^2$ hole.

**Table H-7: Maximum Plume Lengths** (See Section F)

| **Commodity** | **LEL (ppm)** | **Distance to LEL** |
|---|---|---|
| Gasoline (n-heptane)[1] | 10,000 | 1.3 mi |
| Methane | 44,000 | 818 yards |
| Ethane | 29,000 | 2.9 mi |
| Ethylene | 23,000 | 2.4 mi |
| Propane | 20,000 | 2.4 mi |
| Pentane (n-pentane) | 13,000 | 2.3 mi |
| Acetylene | 25,000 | 1567 yards |
| Benzene | 12,000 | 1.2 mi |
| Toluene | 12,000 | 693 yards |
| Methanol | Water soluble – no plume | |
| Ethanol | Water soluble – no plume | |
| Ammonia | 160,000 | 1031 yards |
| Naphtha | 10,500 | 1.9 mi |

The risk analysis previously done for LNG plumes can now be revised to consider all potential gas plumes. The "at-risk" distance is based on the maximum plume length "$L_p$". Given that the ESP plant site is 1.1 miles from the river, if the Mississippi were ruler-straight, this would be a river stretch of $(L_p^2 - 1.1^2)^{1/2}$ miles to the north and south, or $2*(L_p^2 - 1.1^2)^{1/2}$ miles total.

These at-risk distances make the release point potentially further from the site than considered in the previous LNG case. Hence the 0.06 probability that the plume would be directed to the plant with winds gentle enough to avoid dispersion is conservative, since starting from a more distant point increases the probability of missing the site.

The risk formula becomes:

Risk = f(spill/mile)*L(miles)*P(plume forms)*P(wind blows plume to the site)*P(ignition) [Eq. 2]

Where:

f(spill/mile) = value from Equation 1 based on spill volume
L(miles) = value based on plume length according to $2*(L_p^2 - 1.1^2)^{1/2}$
P(plume forms) = value to reflect conditional probability that a combustible vapor cloud can form
P(correct met conditions) is kept conservatively at 0.06 despite the longer distance
P(ignition) kept conservatively at 1

The new term, the conditional probability that a plume forms, is introduced to reflect that fact that few spills result in vapor clouds that ignite. Without this term, Equation 2 implies that any spill that occurs will produce a flammable plume that will drift in some direction and ignite. Obviously, this does not occur with every spill, and it will be material dependent.

4.1 Gasoline Plume

The largest spill in the Attachment 1 database is a 124,000 gallon gasoline spill which occurred in the Ohio River 11/7/2001 at Louisville. There was no associated fire. In fact, gasoline spills happen at a high frequency, and it is difficult to locate records of resultant drifting clouds that subsequently ignited at a distant location.

The factors that would prevent the theoretical 1.3 mile gasoline plume from forming at a marine accident near the ESP site include the following:

1. River currents removing the gasoline. The extremely large volume involved (5000 tons of gasoline is equal to about 1.6 million gallons) would be (at least partially) dispersed by the river current while being discharged from the vessel. This downstream dispersion will aid in removal of the threat of gathering enough gasoline to meet the plume analysis assumptions. This is assigned a factor of 0.3 to represent a 70% chance of river dispersion prior to forming a vapor cloud.
2. Ignition at the source of the spill. The energy involved in ripping open a very large hole in a steel vessel would likely cause a spark or fire that would act to prevent vapor cloud formation. This is assigned a factor of 0.8 to represent a 20% chance of early ignition.
3. Accident response to halt leaking or absorb the spilled material. This is assigned a factor of 0.6 to represent a 40% chance of event containment over the time of the spill.
4. The types of spills near the ESP site are less likely to be the high volume spills needed for plume formation. There are no nearby bridges, structures or cross traffic (see Figure H-1). Groundings or allisions (defined as striking a stationary object as opposed to collisions between moving vessels) can be virtually eliminated as spill causes in this area. This is represented with a factor of 0.5 to represent the particularly benign aspect of the river near the ESP site. It is noted

that none of the many spills reported occurred in this stretch of river between Lat: 31° 59' to Lat 32°03'.

The product of these four factors is 0.07. Although the individual terms are estimated, collectively the value is reasonable, particularly for this safe section of the river. As noted, gasoline spills happen at high frequency, and it was not possible to identify any cases of a resulting drifting plume that ignited at any distance from the accident. A value of 0.07 developed here in association with a value of 1.0 for delayed ignition implies that for every 14 spills of gasoline, there is one plume that bursts into fire at a distant ignition source.

4.2 LNG Plume Assessment

The LNG plume is conservatively modeled as having the length resulting from an ethane release (2.9 miles). The factors making it less likely to form are:

1. Unusual safety precautions in LNG shipments. The spill frequency for LNG is justifiably reduced compared to other commodities by a factor of 0.5.
2. Ignition at the source of the spill. The energy involved in ripping open a very large hole in a steel vessel would likely cause a fire that would act to prevent vapor cloud formation. This ignition is far more likely with LNG vapor than with liquid gasoline. The failure of LNG to ignite during an accident is assigned a value of 0.1.
3. The types of spills near the ESP site are less likely to be the high volume spills needed for plume formation. There are no nearby bridges or ports or cross traffic or submerged rocks. Groundings or allisions can be virtually eliminated as spill causes in this area. This is represented with a factor of 0.5 considering the particularly benign aspect of the river near the ESP site.

The product of these factors combines to 0.025.

4.3 Naphtha, Acyclic Hydrocarbons, and Benzene Plumes

The conditional probability credited is assumed equal to that of gasoline, 0.07

The final result of the risk assessment is quantified in Table H-8.

**Table H-8: Risk of Flammable Vapor Clouds Extending to Site**

| Commodity | Volume of spill assumed in plume calc (tons) | Spill frequency f (mile-yr$^{-1}$) | Plume Length[3] (miles) | Conditional Probability of Plume formation | Probability of correct met conditions | Probability. of delayed combustion | Risk |
|---|---|---|---|---|---|---|---|
| Gasoline | 5654 | 5.94E-06 | 1.3 | .07 | .06 | 1 | 3.5E-08 |
| LNG[1] | 4850 | 5.01E-07 | 2.9 | .025 | .06 | 1 | 4.0E-09 |
| Naphtha & Solvents | 5386 | 1.86E-06 | 1.9 | .07 | .06 | 1 | 2.4E-08 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Acyclic Hydrocarbons – NEC[2] | 4260 | 7.92E-08 | 2.3 | .07 | .06 | 1 | 1.3E-09 |
| Benzene | 3852 | 2.29E-07 | 1.2 | .07 | .06 | 1 | 9.2E-10 |
| Toluene | 4596 | 2.10E-07 | plume does not reach site | | | | 0 |
| Ammonia | 2902 | 2.38E-06 | plume does not reach site | | | | 0 |
| Total | | | | | | | 6.5E-08 |

Note 1. Here the LNG component has $f = 2.7\% * 10^{(-0.5027*LOG(3891)-2.879)}$ based on total LNG shipping data, and the plume length of ethane, which has the longest plume length of the constituents of LNG (methane, ethane, ethylene, and propane).
Note 2: Plume length for pentane is used since it is longer than that of acetylene.
Note 3: At-risk length is $2*(\text{plume length}^2 - 1.1^2)^{0.5}$

### 4.6 Conclusions to Plume Assessment

Although the frequencies contained in Table H-8 are higher than those of Table H-5 (except toluene), they are still considered acceptably low. As in the case of detonation, these low numbers are justified by considering the global rarity of a flammable plume generated in marine accidents drifting to remote ignitions over a mile away. The rarity of such events on a global scale helps explain the extremely low probabilities associated with a short 3-mile stretch of quiet river by the ESP site. It is also noted that the meteorological conditions required to move a plume 1.1 miles from the river to the site involve low wind speeds.

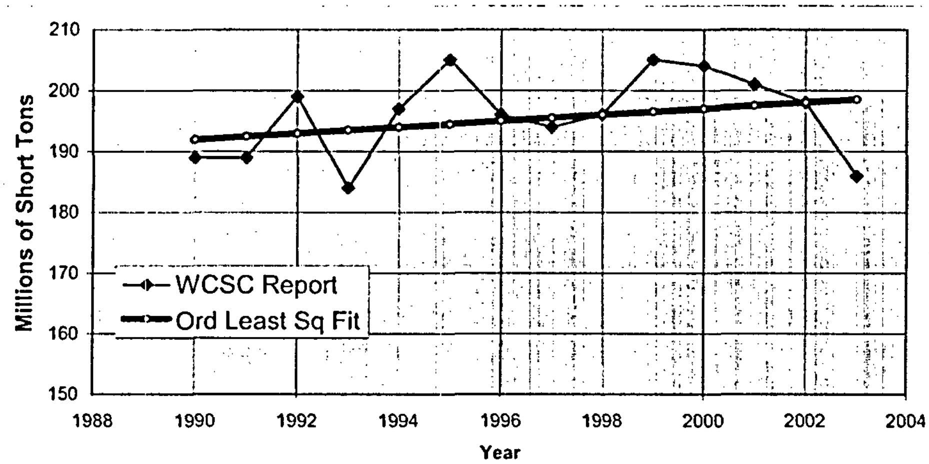
## 5. Risk Assessment Conclusions

The conclusion is that the risk to the ESP site of an accidental explosion or flammable vapor cloud release on the Mississippi River is sufficiently small such that these events are not a credible design basis for the ESP site.

## I. Review of Commodity Shipment Trends

Analysis assumptions regarding single barge capacity and average tonnage per shipment (past the ESP site) were developed based on USAEC Waterborne Commerce Statistics Center (WCSC) PTP reports for calendar years 2003 and 2004. To consider how cargo shipping has varied in the past and how it might change in the future, WCSC public reports for past years were reviewed.

**Figure I-1. Mississippi River Totals, All Commodities**[8]
(Mouth of Ohio R. to Baton Rouge, LA)




Note: Compares annual data provided in annual WCSC reports and an ordinary least squares fit to WCSC reported values.

Figure I-1 illustrates WCSC data reported for total cargo (i.e., that is all commodities, including forest products, minerals, ore, manufactured goods, iron and steel products, scrap, etc.) shipped on the Mississippi River (from the mouth of the Ohio River to Baton Rouge, La). This data included that component of cargo shipped past the ESP site. The reported data covering 14 years (1990 to 2003) for annual total tonnage (all commodities) are illustrated in Figure I-1. The average of this 14 year period was 196 thousand tons (with a variance of minimum to maximum of about 11%). While the annual data exhibits relatively wide swings, an ordinary least squares fit of the data suggests a slight increasing trend over this period.

Since cargo tonnage for petroleum and chemical products represent only a small portion of total river cargo, a review of certain specific commodities was performed. Annual WCSC reports for 1993 through 2003 were consulted for annual shipments on the Mississippi River (again from the Mouth of the Ohio River to Baton Rouge, La) for four of

[8] This data was collected from WCSC annual reports from 1993 through 2003 (Reference 16). The 1999 report was used as the source for the summary tonnage from 1993 back to 1990.

the commodities of interest, i.e., crude petroleum, gasoline, naphtha & solvents, and LNG. Data on these commodities were considered sufficient to reveal trends, if any, for the general group of potentially explosive materials. Figures I-2a and I-2b illustrate this cargo information for these 11 years.

Inspection of curves in Figures I-2a and I-2b, in general, reveals no consistent trends over the 11 years, particularly for naphtha/solvents. However, since 2000 and 2001, a gradual increasing trend for gasoline and LNG was noted, while crude petroleum showed a decreasing rate. Given the lack of clear patterns in the data illustrated in Figures I-2a and I-2b, projections for the future would be inappropriate. However, at the same time, it recognized that river transportation information would be reviewed during the preparation of a COL application.

The general intent to conduct such surveys was discussed by Entergy in its remarks to the ACRS in meetings held on May 16, 2005[9] (Sub-committee, DSER) and December 8, 2005[10] (Full committee, FSER review). The expected process regarding time-dependent qualities of site characteristics was addressed in some detail in the May 16 meeting. It was noted that at COL, a survey would be made considering safety margin and the potential for change in site characteristics. As considered required, selected site characteristics would be confirmed and/or adjusted as necessary to resolve any risk significant issues. A number of specific examples were suggested, including a survey of transportation systems in the site vicinity.

In the December 8 meeting, similar remarks were summarized, in particular reference to potential changes in site meteorological conditions in the context of recent Gulf Coast hurricane experience. However, the same prudent and reasonable process would apply as well to other categories of site characteristics, such as potential changes in Mississippi River transportation properties. Reviews at COL would seek to identify new and significant information, important to the analyses and conclusions provided in or to support the ESP application. Relevant to this response, the review at COL would confirm that assumptions regarding the type of commodities, maximum barge size and shipping frequency remain bounding and that conclusions in the SSAR remain valid for use, as appropriate, at COL.

[9] See Slides 11-14, Entergy/SERI presentation to ACRS, May 16, 2005 (Reference 25).
[10] See Slides 16, Entergy/SERI presentation to ACRS, December 8, 2005 (Reference 19).

**Figure I-2a. Mississippi River: Crude Petroleum and Gasoline**
(Mouth of Ohio R. to Baton Rouge, LA)

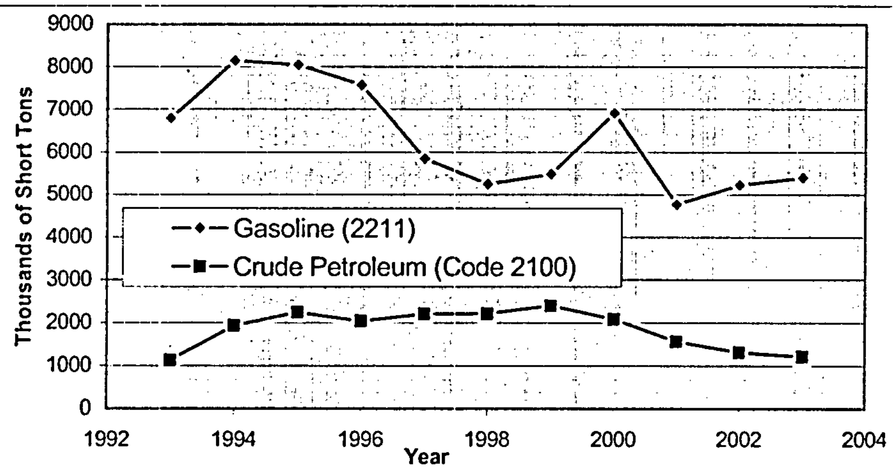
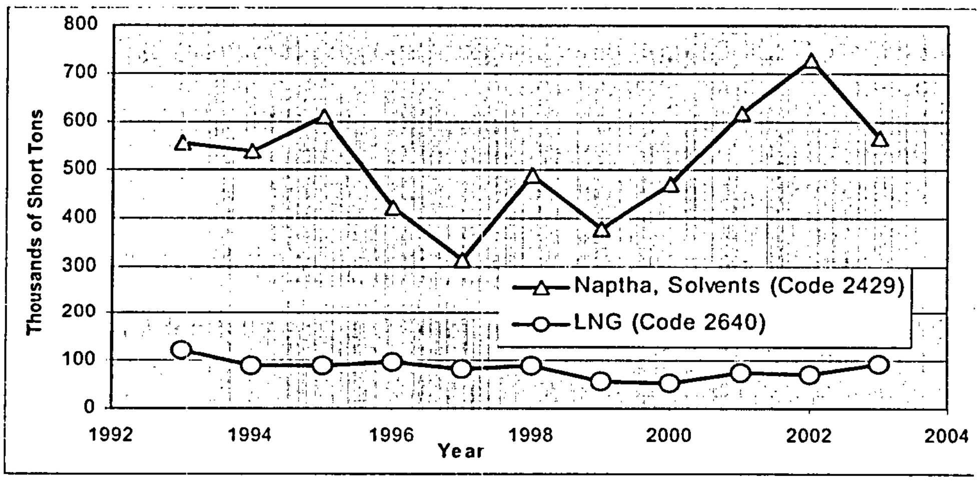



**Figure I-2b. Mississippi River: Naphtha/Solvents and LNG**
(Mouth of Ohio R. to Baton Rouge, LA)




## J. Proposed Changes to the ESP Application SSAR

Proposed changes to SSAR Section 2.2.3 and 3.1.5 are provided in Attachment 4.

## K. Conclusions

This assessment determined risks associated with transportation of flammable and explosive cargoes on the Mississippi River to be on the order of E-08 per year. Therefore, such events are not considered design basis events, consistent with the criteria of Regulatory Guide 1.70 (Rev. 3), Section 2.2.3.1 and NRC Review Standard RS-002 (Section 2.2.3). Risks of this magnitude are considered to meet the site suitability requirements of 10 CFR 100.20(b) and 100.21(c) in that the predicted risks from these transportation related hazards are very low and pose no undue risk to a facility proposed to be located at the ESP site.

## L. References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**Review and Identification of Hazardous Cargo on the Mississippi River Warranting Additional Detailed Analysis**

The following discussion provides additional detail regarding the review of commodities transported on the Mississippi River, identified in SSAR Table 2.2-4, as warranting more detailed assessment as an explosive hazard. This additional assessment concluded that several of these commodities then required detailed analytical treatment regarding local detonation effects and consideration of the delayed ignition of vapor cloud.

For a commodity to form a vapor cloud, it must have a substantial vapor pressure at ambient conditions. Commodities that will not produce a vapor cloud were eliminated from further consideration.

A common measure of a commodity's ability to form a flammable vapor (one that is above the lower explosive limit (LEL)) is the flash point. A commodity's flash point is the lowest temperature at which that substance can maintain a flame. Below this temperature, no flame or explosion is possible. Commodities with flash points above 100°F can be eliminated from further consideration. It is unlikely that commodities with flash points above 40°F will support an explosive detonation at any ambient temperature, but these are still referred for further analysis.

Some commodities may form a vapor cloud that will support a flame, but are known to have chemical properties such that an open vapor cloud will form a deflagration rather than a detonation. Some commodities are water soluble, so a spill onto water will disperse the material rather than form a large vapor cloud. Such commodities may still have risks associated with enclosed vapor cloud explosions, but free vapor cloud explosions will not pose a legitimate risk and can be eliminated from further consideration.

Unless otherwise noted, values for material properties presented here were obtained from Material Safety Data Sheets, available from the Vermont SIRI project (http://siri.org/msds/index.php). The values are considered reasonable for this screening review.

An evaluation of the properties of each commodity is provided below.

See Attachment 1, Section L, for references cited below.

1. Crude petroleum
   Crude oil is a product that is refined into several other categories of petroleum products, including (in rough order by API gravity: gasoline, kerosene, distillate fuel oils, residual fuel oils, lube oils and greases, asphalt, tar, and pitch, and petroleum coke (all listed below)).

When raw petroleum comes from the ground, the naturally occurring product is separated in to crude oil and natural gas. The light natural gas fractions are separated to eliminate pipeline transport of a two-phase fluid. Commercially, they will never be transported together. The remaining fractions are heavier, less volatile fractions.

Crude oil is a natural product, so its properties depend on the source. Flash points may range from less than 75 °F to above 200°F. Explosive limits vary widely as well. Generally, crude oil will not form a flammable mixture below 75°F. Due to the limited volatility of the product, any wind will quickly disperse a vapor cloud that might form. Because gasoline is included in the commodity, additional analysis was required. Properties of gasoline, the lightest fraction in the crude oil (and a product that requires cracking of the crude oil into smaller, more volatile components) are conservatively used for enclosed detonation analysis.

2. Gasoline
Gasoline has a LEL of approximately 1.4% and a UEL of about 7.6%. It has a flash point of about -36°F. Additional analysis of this product was required.

3. Kerosene
Kerosene has a LEL of approximately 0.7% and a UEL of about 5%. It has a flash point greater than 100°F. It will not form a flammable mixture below 100°F. Additional analysis of this product was deemed unnecessary.

4. Distillate fuel oil
Distillate cuts of oil are lighter fuel oils, commercially referred to as No. 1 and No. 2 Fuel Oil. No. 1 Fuel Oil has a LEL of 1.1 % and Flash point of 120°F. It will not form a flammable mixture below 120°F. No. 2 Fuel Oil has a LEL of 0.7 %, a UEL of 5.0% and Flash point of 130°F. Distillate fuel oils will not form a flammable mixture below 130°F. Additional analysis of this product was deemed unnecessary.

5. Residual fuel oil
Residual cuts of oil are heavier fuel oils, commercially referred to as No. 4, No. 5 and No. 6 Fuel Oil. No. 4 Fuel Oil has a LEL of 1.0 %, a UEL of 5.0% and Flash point of 140°F. It will not form a flammable mixture below 140°F. No. 5 Fuel Oil has a Flash point of 130°F. It will not form a flammable mixture below 130°F. No. 6 Fuel Oil has a LEL of 1.0 %, a UEL of 5.0% and Flash point of 140°F. It will not form a flammable mixture below 140°F. Additional analysis of this product was deemed unnecessary.

6. Lube oil & greases
Lubricating oils and greases are non-volatile products. They will not transport by wind or water. They will not form a VCE or an enclosed detonation. Additional analysis of this product was deemed unnecessary.

7. Asphalt, tar & pitch
Asphalt, tar and pitch are non-volatile products. They will not transport by wind or water. They will not form a VCE or an enclosed detonation. Additional analysis of this product was deemed unnecessary.

8. Petroleum coke
This is a solid product that will burn but will not transport by wind or water. Additional analysis of this product was deemed unnecessary.

9. Liquid natural gas
Liquid natural gas (LNG) is a term that is used generically for a range of products, including cryogenically liquefied natural gas, other liquefied petroleum products, and liquefied natural gasoline (or drip gas). LNG may also be specifically used for liquefied natural gas. Liquefied natural gas as natural gas is primarily methane (minimum 75% for pipeline quality, typically closer to 95%). Other gaseous petroleum products that are liquefied include blends of gases such as ethane, ethylene, and propane.

Gases liquefied by refrigeration are treated as liquid releases that then evaporate (Reference 9). The evaporation rate can be rapid, and pool fires can occur at the immediate spill site. If no ignition source is present, the evaporation rate can result in a plume from the site that can be flammable. The vapor plume will not detonate in such a fashion to cause an overpressure event. Rather, it will burn with a relatively slow deflagration rate of several feet per second (Reference 26 identifies that pure methane is not known to explode if the release is into unconfined space). A free vapor cloud explosion is not credible.

Methane has a LEL of 5.0%, a UEL of 15.0% and Flash point of -306°F. Ethane has a LEL of 3.0%, a UEL of 12.5% and Flash point of -211°F. Ethane (commonly called ethylene) has a LEL of 3.1%, a UEL of 32% and Flash point of 0°F. Propane has a LEL of 2.3%, a UEL of 9.5% and Flash point of -156°F. Additional analysis of this product was performed for confined vapor explosion and flammable vapor plume.

10. Nitrogenous fertilizer
This is a non-volatile product that will burn but will not transport by wind or water. Additional analysis of this product was deemed unnecessary.

11. Phosphatic fertilizer
This is a non-volatile product with a very high flash point (>400°F). It will not form a flammable mixture below 400°F. Additional analysis of this product was deemed unnecessary.

13. Potassic fertilizer
This is a non-volatile product that will burn but will not transport by wind or water. Additional analysis of this product was deemed unnecessary.

14. Fertilizer and mixes NEC
No fertilizer mixes that are NEC (not elsewhere classified) are known to present specific explosion hazards without combining them with other commodities. Additional analysis of this product was deemed unnecessary.

15. Naphtha & solvents
Naphtha (LEL=1.0%, UEL=5.9%, Flash point = -49°F) is a cut of midrange hydrocarbons. "Solvents" cover a wide range of products. Acetone (LEL=2.5%, UEL=12.8%, Flash point = -4°F) is a highly flammable solvent product which is assumed to be conservative for all hydrocarbon solvents. Acetone is highly soluble in water and thus is unable to evaporate sufficiently to form a local vapor cloud explosion before it is transported away by dissolution into the river, however, not all items in this classification are water soluble. Additional analysis of this product category was required.

16. Petroleum products NEC
No petroleum products that are NEC are known to present specific explosion hazards without combining them with other commodities. For hazard analysis, this category was treated as gasoline for conservatism.

17. Acyclic hydrocarbons
Acyclic hydrocarbons (branched and straight-chain alkanes, alkenes and alkynes) cover a wide variety of products. Low molecular weight items fall in to the LNG classification. High molecular weight hydrocarbons will tend to be non-volatile (similar to distillate and residual fuel oils, as distillate and residual fuel oils are a mixture of cyclic and acyclic hydrocarbons). Volatile hydrocarbons that are not shipped cryogenically pose risks. Alkanes from pentanes (C5; LEL=1.5%, UEL=7.8%, Flash point = -56°F) up to nonanes (C9; LEL=0.8%, UEL=2.9%, Flash point = 88°F), alkenes (e.g., pentene; LEL=1.4%, UEL=8.7%, Flash point =-18°F) and alkynes (e.g., acetylene, LEL=2.5%, UEL=82%) pose greatest risks. Additional analysis was required. To determine if pentane or acetylene were limiting, analyses were performed assuming all the commodity was either 100% pentane or 100% acetylene to determine which was most conservative.

18. Benzene & toluene
This category covers the most common cyclic hydrocarbons, Benzene (LEL=1.5%, UEL=8.0%, Flash point = 12°F) and Toluene (LEL=1.3%, UEL=6.8%, Flash point = 40°F). Additional analysis of these products was required.

19. Alcohols
Alcohols cover a wide range of hydrocarbon products. Most volatile among them are methanol (LEL=6.0%, UEL=36%, Flash point = 54°F) and ethanol (LEL=3.3%, UEL=19.0%, Flash point = 58°F). Alcohols are highly soluble in water and thus are unable to evaporate sufficiently to form a local vapor cloud explosion before they are transported away by dissolution into the river. Additional analysis of these products for enclosed detonation risks and consequences was required.

20. Sulfuric acid
Sulfuric Acid is not flammable or explosive. Additional analysis of this product was deemed unnecessary.

21. Ammonia
Ammonia (LEL=16%, UEL=25%) is not flammable, but confined vapors may explode. Additional analysis of this product for enclosed detonation risks and consequences was required.

22. Sodium hydroxide
Caustic soda is not flammable or explosive. Additional analysis of this product was deemed unnecessary.

23. Wood & resin chemicals
Wood and resin chemicals tend to be stable products with flash points in excess of 100°F. They are not expected to form flammable mixtures below 100°F. Additional analysis of these products was deemed unnecessary.

24. Chemical products NEC
No chemical products that are NEC were known to present specific explosion hazards without combining them with other commodities. Additional analysis of this product was deemed unnecessary.

**WCSC MS River Hazardous Cargo Summary Data: 2003 & 2004**
**(Notes 1, 2, 3, 8)**

| Year | WCSC Pub Grp | WCSC Code | Commodity | Max. Barge Capacity (CAP_TONS) (Notes 3, 4) | Total Trips (Note 5) | Total Tons (Note 6) | Tons/Trip (Note 7) | Ratio of Tons/Trip and Max. Barge Capacity (%) |
|---|---|---|---|---|---|---|---|---|
| 2003 | 2211 | 33411 | Gasoline | 5654 | 1109 | 2974473 | 2682 | 47% |
| 2003 | 2330 | 33419 | Distillate Fuel Oil | 5654 | 1207 | 3340011 | 2767 | 49% |
| 2003 | 2429 | 33429 | Naptha & Solvents | 5000 | 207 | 500450 | 2418 | 48% |
| 2003 | 2640 | 34000 | LNG | 4850 | 85 | 92298 | 1086 | 22% |
| 2003 | 3212 | 51122 | Benzene | 3852 | 35 | 57271 | 1636 | 42% |
| 2003 | 3212 | 51123 | Toluene | 2400 | 20 | 30038 | 1502 | 63% |
| 2003 | 3273 | 52261 | Ammonia | 2902 | 294 | 731960 | 2490 | 86% |
| 2003 | 3211 | 33300 | Acyclic Hydrocarbons - NEC | 4260 | 14 | 8585 | 613 | 14% |
| 2003 | 2100 | 51119 | Crude Petroleum | 4670 | 231 | 874953 | 3788 | 81% |
| 2004 | 2211 | 33411 | Gasoline | 4850 | 806 | 2062837 | 2559 | 53% |
| 2004 | 2330 | 33419 | Distillate Fuel Oil | 5029 | 1088 | 2952750 | 2714 | 54% |
| 2004 | 2429 | 33429 | Naptha & Solvents | 5386 | 315 | 842406 | 2674 | 50% |
| 2004 | 2640 | 34000 | LNG | 3891 | 71 | 89027 | 1254 | 32% |
| 2004 | 3212 | 51122 | Benzene | 3500 | 31 | 53055 | 1711 | 49% |
| 2004 | 3212 | 51123 | Toluene | 4596 | 41 | 81989 | 2000 | 44% |
| 2004 | 3273 | 52261 | Ammonia | 2902 | 317 | 787952 | 2486 | 86% |
| 2004 | 3211 | 33300 | Acyclic Hydrocarbons - NEC | 4260 | 9 | 12919 | 1435 | 34% |
| 2004 | 2100 | 51119 | Crude Petroleum | 4670 | 296 | 1066176 | 3602 | 77% |

NOTES:

1. - Refer to "Memo to File," dated 2/13/2006, pgs 35 - 37 for understandings of USACE "Pass-the-Point" analysis "raw data".
2. - Summary Data developed from WCSC raw data reports (2/7/2006) in following pages, 2 through 34.
3. - CAP_TONS - Defined by USACE as the max capacity for a barge in that tow. See also Memo to File (Note 1).
4. - Largest CAP_TONS numbers in 2003 and 2004 raw data are in **bold** font.
5. - Total Trips - Sum of all shipments (TRIPS) for the commodity for the year, including the number of "zero" trips provided by USACE
6. - Total Tons - Sum of all shipments (TONS) for the commodity for the year
7. - Tons/Trip - Ratio of the total annual tonnage divided by the total trips, per year, for each commodity.
8. - Highlighted information represents additional clarifying info added, and analysis of WCSC raw data to develop this summary table.

Waterborne Commerce Statistics Center — MS River Transport Data - 2003

| Com Name | COMMODITY | DIRECTION | ESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Crude Petrol. | 33300 | Upbound | 5 | 1619 | 4670 | 297.5 | 54 | 1 | 3551 |
| Crude Petrol. | 33300 | Upbound | 5 | 1906 | 3390 | 297 | 54 | 5 | 19136 |
| Crude Petrol. | 33300 | Upbound | 5 | 1914 | 3390 | 297 | 54 | 6 | 23108 |
| Crude Petrol. | 33300 | Upbound | 5 | 1961 | 3390 | 297 | 54 | 6 | 22669 |
| Crude Petrol. | 33300 | Upbound | 5 | 1898 | 3100 | 295 | 54 | 123 | 465458 |
| Crude Petrol. | 33300 | Upbound | 5 | 1916 | 3100 | 275 | 54 | 1 | 3066 |
| Crude Petrol. | 33300 | Upbound | 5 | 1916 | 3100 | 275 | 54 | 58 | 221748 |
| Crude Petrol. | 33300 | Upbound | 5 | 1918 | 3100 | 295 | 54 | 31 | 116217 |
| | | | | | | "Zero" TRIPS | | 0 | |
| | | | | | | Sum all TRIPS and TONS | | 231 | 874953 |
| | | | | | | | | TONS/TRIP | 3788 |

| Com Name | COMMODITY | DIRECTION | ESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Gasoline | 33411 | Upbound | 5 | 1959 | 5654 | 359 | 54 | 2 | 4176 |
| Gasoline | 33411 | Upbound | 5 | 1959 | 5654 | 359 | 54 | 2 | 7660 |
| Gasoline | 33411 | Upbound | 5 | 1992 | 5000 | 295.1 | 54 | 3 | 9405 |
| Gasoline | 33411 | Upbound | 5 | 1936 | 4850 | 290 | 54 | 1 | 3354 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4802 | 297.5 | 54 | 3 | 3175 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4802 | 297.5 | 54 | 1 | 2251 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4802 | 297.5 | 54 | 0 | 2049 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4802 | 297.5 | 54 | 1 | 3209 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4802 | 297.5 | 54 | 2 | 6789 |
| Gasoline | 33411 | Upbound | 5 | 1681 | 4802 | 297.5 | 54 | 1 | 317 |
| Gasoline | 33411 | Upbound | 5 | 1681 | 4802 | 297.5 | 54 | 1 | 2431 |
| Gasoline | 33300 | Upbound | 5 | 1637 | 4596 | 297.5 | 54 | 1 | 3551 |
| Gasoline | 33411 | Upbound | 5 | 1732 | 4528 | 295 | 54 | 3 | 9770 |
| Gasoline | 33411 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 1 | 583 |
| Gasoline | 33411 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 3 | 3260 |
| Gasoline | 33411 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 1 | 2431 |
| Gasoline | 33411 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 2 | 7891 |
| Gasoline | 33300 | Downbound | 5 | 1619 | 4387 | 297.5 | 54 | 2 | 6802 |
| Gasoline | 33300 | Downbound | 5 | 1619 | 4387 | 297.5 | 54 | 6 | 21784 |
| Gasoline | 33300 | Upbound | 5 | 1619 | 4387 | 297.5 | 54 | 2 | 7610 |
| Gasoline | 33411 | Downbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 160 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 914 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 6 | 6848 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 1721 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 13 | 48642 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 2732 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 33 | 107329 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 16 | 55190 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 4 | 18192 |
| Gasoline | 33411 | Upbound | 5 | 1754 | 4338 | 297.5 | 54 | 1 | 3000 |
| Gasoline | 33411 | Upbound | 5 | 1754 | 4338 | 297.5 | 54 | 32 | 96000 |
| Gasoline | 33300 | Upbound | 5 | 1619 | 4337 | 297.5 | 54 | 2 | 7668 |
| Gasoline | 33411 | Upbound | 5 | 1754 | 4322 | 297.5 | 54 | 1 | 1546 |
| Gasoline | 33411 | Upbound | 5 | 1754 | 4322 | 297.5 | 54 | 2 | 7235 |
| Gasoline | 33411 | Upbound | 5 | 1754 | 4322 | 297.5 | 54 | 32 | 113823 |
| Gasoline | 33411 | Upbound | 5 | 1754 | 4322 | 297.5 | 54 | 27 | 91989 |
| Gasoline | 33411 | Upbound | 5 | 1892 | 4305 | 297.5 | 54 | 1 | 3243 |
| Gasoline | 33411 | Upbound | 5 | 2254 | 4289 | 297 | 54 | 6 | 16825 |
| Gasoline | 33411 | Upbound | 5 | 1400 | 4196 | 297 | 54 | 1 | 3052 |

Waterborne Commerce Statistics Center MS River Transport Data - 2003

| Com Name | COMMODITY | DIRECTION | VESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Gasoline | 33411 | Upbound | 5 | 1619 | 4196 | 297.6 | 54 | 1 | 3525 |
| Gasoline | 33411 | Upbound | 5 | 2033 | 4196 | 297 | 54 | 1 | 3512 |
| Gasoline | 33411 | Upbound | 5 | 2012 | 4180 | 300 | 54 | 1 | 2516 |
| Gasoline | 33411 | Upbound | 5 | 2012 | 4180 | 300 | 54 | 2 | 6699 |
| Gasoline | 33411 | Upbound | 5 | 2029 | 4158 | 300 | 54 | 2 | 6492 |
| Gasoline | 33411 | Upbound | 5 | 1445 | 4090 | 297 | 54 | 2 | 6744 |
| Gasoline | 33411 | Upbound | 5 | 1897 | 4059 | 297.5 | 54 | 1 | 3481 |
| Gasoline | 33411 | Upbound | 5 | 1897 | 4059 | 297.5 | 54 | 27 | 84332 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4054 | 297.5 | 54 | 5 | 39105 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4048 | 297.5 | 54 | 3 | 10246 |
| Gasoline | 33411 | Upbound | 5 | 1891 | 4031 | 281.7 | 54 | 1 | 3443 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3988 | 297.6 | 54 | 8 | 28254 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3942 | 297.5 | 52 | 2 | 5608 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3939 | 297 | 54 | 1 | 3007 |
| Gasoline | 33411 | Upbound | 5 | 2059 | 3925 | 297.5 | 54 | 10 | 40435 |
| Gasoline | 33411 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 1 | 3261 |
| Gasoline | 33411 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 3 | 9913 |
| Gasoline | 33411 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 2 | 6486 |
| Gasoline | 33411 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 12 | 40080 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 1 | 2836 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 4 | 13288 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 15 | 49866 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 20 | 59080 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 3 | 7430 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 2727 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 5 | 16651 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 5 | 16026 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 47 | 150473 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 41 | 128928 |
| Gasoline | 33411 | Upbound | 5 | 1702 | 3796 | 297.6 | 54.1 | 1 | 1035 |
| Gasoline | 33411 | Upbound | 5 | 1702 | 3796 | 297.6 | 54.1 | 0 | 2402 |
| Gasoline | 33411 | Upbound | 5 | 1702 | 3796 | 297.6 | 54.1 | 3 | 10428 |
| Gasoline | 33411 | Upbound | 5 | 1702 | 3796 | 297.6 | 54.1 | 12 | 41816 |
| Gasoline | 33411 | Upbound | 5 | 1661 | 3792 | 295 | 54 | 1 | 3347 |
| Gasoline | 33411 | Upbound | 5 | 1661 | 3792 | 295 | 54 | 2 | 8732 |
| Gasoline | 33411 | Upbound | 5 | 1661 | 3792 | 295 | 54 | 2 | 6163 |
| Gasoline | 33411 | Upbound | 5 | 1661 | 3792 | 295 | 54 | 27 | 79018 |
| Gasoline | 33411 | Upbound | 5 | 2071 | 3740 | 300 | 54 | 13 | 43938 |
| Gasoline | 33411 | Upbound | 5 | 1717 | 3725 | 297.6 | 54 | 2 | 6101 |
| Gasoline | 33411 | Upbound | 5 | 1724 | 3725 | 297 | 54 | 3 | 9208 |
| Gasoline | 33411 | Upbound | 5 | 1724 | 3725 | 297.5 | 54 | 1 | 3372 |
| Gasoline | 33411 | Upbound | 5 | 1717 | 3724 | 297.5 | 54 | 1 | 3332 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3700 | 297.5 | 54 | 1 | 318 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3700 | 297.5 | 54 | 13 | 44286 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3700 | 297.5 | 54 | 1 | 4695 |
| Gasoline | 33411 | Upbound | 5 | 1897 | 3688 | 290 | 54 | 1 | 3443 |
| Gasoline | 33411 | Upbound | 5 | 2044 | 3688 | 290 | 54 | 1 | 3113 |
| Gasoline | 33411 | Upbound | 5 | 2044 | 3688 | 290 | 54 | 1 | 3355 |
| Gasoline | 33411 | Upbound | 5 | 2045 | 3688 | 290 | 54 | 1 | 3354 |
| Gasoline | 33411 | Upbound | 5 | 1740 | 3674 | 297.6 | 54.1 | 2 | 6798 |
| Gasoline | 33411 | Upbound | 5 | 1731 | 3673 | 297.6 | 54.1 | 19 | 66395 |

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| Com Name | COMMODITY | DIRECTION | ESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Gasoline | 33411 | Upbound | 5 | 844 | 3663 | 155 | 54 | 1 | 1625 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 1 | 2836 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 2 | 6310 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 4 | 15279 |
| Gasoline | 33411 | Upbound | 5 | 1660 | 3656 | 297.6 | 54 | 1 | 2403 |
| Gasoline | 33411 | Upbound | 5 | 1660 | 3656 | 297.6 | 54 | 2 | 6435 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3646 | 297.5 | 54 | 4 | 14763 |
| Gasoline | 33411 | Downbound | 5 | 1574 | 3633 | 297.5 | 52.5 | 1 | 3280 |
| Gasoline | 33411 | Upbound | 5 | 1574 | 3633 | 297.5 | 52.5 | 6 | 26444 |
| Gasoline | 33411 | Upbound | 5 | 1344 | 3622 | 264.1 | 50 | 1 | 2795 |
| Gasoline | 33411 | Downbound | 5 | 1619 | 3581 | 297.5 | 54 | 1 | 2944 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3581 | 297.5 | 54 | 1 | 3209 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3579 | 297.5 | 54 | 1 | 3505 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3579 | 297.5 | 54 | 20 | 62770 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3576 | 297.5 | 54 | 1 | 3134 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3574 | 297.5 | 54 | 1 | 3372 |
| Gasoline | 33411 | Upbound | 5 | 1710 | 3571 | 297.5 | 54 | 1 | 2671 |
| Gasoline | 33411 | Upbound | 5 | 1710 | 3525 | 297.5 | 54 | 2 | 5706 |
| Gasoline | 33411 | Upbound | 5 | 1721 | 3525 | 297.5 | 54 | 4 | 11395 |
| Gasoline | 33411 | Upbound | 5 | 816 | 3500 | 150 | 54 | 1 | 1520 |
| Gasoline | 33411 | Upbound | 5 | 1566 | 3500 | 297 | 54 | 3 | 8945 |
| Gasoline | 33411 | Upbound | 5 | 1943 | 3500 | 295 | 54 | 1 | 3243 |
| Gasoline | 33411 | Upbound | 5 | 1943 | 3500 | 295 | 54 | 2 | 5792 |
| Gasoline | 33411 | Upbound | 5 | 2033 | 3446 | 297.5 | 54 | 1 | 3225 |
| Gasoline | 33411 | Upbound | 5 | 1424 | 3397 | 312 | 50 | 1 | 1897 |
| Gasoline | 33411 | Upbound | 5 | 1424 | 3397 | 272.5 | 50 | 2 | 5134 |
| Gasoline | 33411 | Upbound | 5 | 1660 | 3373 | 297.5 | 54 | 3 | 10845 |
| Gasoline | 33411 | Upbound | 5 | 1653 | 3363 | 297.6 | 54.1 | 2 | 6583 |
| Gasoline | 33411 | Upbound | 5 | 1659 | 3317 | 297.5 | 54 | 3 | 9018 |
| Gasoline | 33411 | Upbound | 5 | 1710 | 3317 | 297.5 | 54 | 1 | 2853 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3314 | 297.5 | 54 | 13 | 44356 |
| Gasoline | 33411 | Upbound | 5 | 1958 | 3300 | 297.6 | 52.6 | 1 | 3485 |
| Gasoline | 33411 | Upbound | 5 | 2082 | 3300 | 297.5 | 54 | 4 | 13470 |
| Gasoline | 33411 | Upbound | 5 | 2082 | 3300 | 297.5 | 54 | 1 | 3441 |
| Gasoline | 33411 | Upbound | 5 | 1689 | 3283 | 297.6 | 54.1 | 1 | 3228 |
| Gasoline | 33411 | Upbound | 5 | 1754 | 3283 | 297.5 | 54 | 4 | 13451 |
| Gasoline | 33411 | Upbound | 5 | 1863 | 3203 | 290 | 52.6 | 3 | 8183 |
| Gasoline | 33411 | Upbound | 5 | 841 | 3200 | 148.8 | 54.1 | 1 | 2306 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3200 | 297.5 | 54 | 2 | 2242 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3200 | 297.5 | 54 | 0 | 4378 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3200 | 297.5 | 54 | 1 | 3000 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3200 | 297.5 | 54 | 2 | 6720 |
| Gasoline | 33411 | Upbound | 5 | 1807 | 3200 | 290 | 54 | 1 | 2833 |
| Gasoline | 33411 | Upbound | 5 | 1810 | 3200 | 295 | 54 | 1 | 3113 |
| Gasoline | 33411 | Downbound | 5 | 1850 | 3149 | 290 | 52.5 | 1 | 2944 |
| Gasoline | 33411 | Upbound | 5 | 1850 | 3149 | 290 | 52.5 | 6 | 11753 |
| Gasoline | 33411 | Upbound | 5 | 1439 | 3118 | 297.6 | 54.1 | 4 | 13191 |
| Gasoline | 33411 | Upbound | 5 | 1439 | 3117 | 297.6 | 54.1 | 2 | 6798 |
| Gasoline | 33411 | Downbound | 5 | 2014 | 3100 | 290 | 52.5 | 1 | 2571 |
| Gasoline | 33300 | Downbound | 5 | 1898 | 3100 | 295 | 54 | 1 | 3400 |
| Gasoline | 33300 | Upbound | 5 | 1898 | 3100 | 295 | 54 | 2 | 5094 |

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| Com Name | COMMODITY | DIRECTION | ESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Gasoline | 33300 | Upbound | 5 | 1898 | 3100 | 295 | 54 | 2 | 6132 |
| Gasoline | 33411 | Upbound | 5 | 1839 | 3100 | 290 | 52.5 | 2 | 5771 |
| Gasoline | 33411 | Upbound | 5 | 2014 | 3100 | 290 | 52.5 | 6 | 18801 |
| Gasoline | 33411 | Upbound | 5 | 1543 | 3070 | 264 | 54 | 14 | 38366 |
| Gasoline | 33411 | Downbound | 5 | 2228 | 3000 | 297.5 | 52.5 | 1 | 3283 |
| Gasoline | 33411 | Upbound | 5 | 1464 | 3000 | 267 | 52.5 | 5 | 14336 |
| Gasoline | 33411 | Upbound | 5 | 1543 | 3000 | 280 | 54 | 11 | 32370 |
| Gasoline | 33411 | Upbound | 5 | 1598 | 3000 | 290 | 52.5 | 2 | 5711 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3000 | 297.5 | 54 | 1 | 3670 |
| Gasoline | 33411 | Upbound | 5 | 2228 | 3000 | 297.5 | 52.5 | 20 | 65967 |
| Gasoline | 33411 | Upbound | 5 | 1487 | 2964 | 264 | 54 | 20 | 52724 |
| Gasoline | 33411 | Upbound | 5 | 1555 | 2964 | 264 | 54 | 2 | 1168 |
| Gasoline | 33411 | Upbound | 5 | 1555 | 2964 | 264 | 54 | 0 | 4798 |
| Gasoline | 33411 | Upbound | 5 | 1555 | 2964 | 264 | 54 | 9 | 25704 |
| Gasoline | 33411 | Upbound | 5 | 1675 | 2954 | 264 | 54 | 8 | 24887 |
| Gasoline | 33411 | Upbound | 5 | 1992 | 2890 | 180 | 54 | 1 | 1961 |
| Gasoline | 33411 | Upbound | 5 | 1467 | 2882 | 275 | 54 | 23 | 64895 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 2812 | 297.5 | 54 | 3 | 9221 |
| Gasoline | 33411 | Downbound | 5 | 1908 | 2800 | 295 | 54 | 1 | 2944 |
| Gasoline | 33411 | Upbound | 5 | 2147 | 2700 | 297.5 | 54 | 2 | 6593 |
| Gasoline | 33411 | Upbound | 5 | 1760 | 2593 | 297.6 | 54.1 | 10 | 28927 |
| Gasoline | 33411 | Upbound | 5 | 759 | 2570 | 148.8 | 54.1 | 2 | 4822 |
| Gasoline | 33411 | Upbound | 5 | 759 | 2570 | 148.8 | 54.1 | 1 | 3113 |
| Gasoline | 33411 | Upbound | 5 | 1038 | 2500 | 155.1 | 54 | 7 | 11531 |
| Gasoline | 33411 | Upbound | 5 | 1177 | 2460 | 175.1 | 50 | 5 | 7786 |
| Gasoline | 33411 | Upbound | 5 | 1344 | 2440 | 264 | 50 | 0 | 1302 |
| Gasoline | 33411 | Upbound | 5 | 806 | 2290 | 147.6 | 54 | 13 | 21752 |
| Gasoline | 33411 | Upbound | 5 | 1658 | 2273 | 297.6 | 54.1 | 1 | 3332 |
| Gasoline | 33411 | Upbound | 5 | 1144 | 2231 | 175 | 54 | 9 | 20018 |
| Gasoline | 33411 | Upbound | 5 | 1144 | 2231 | 175 | 54 | 1 | 2205 |
| Gasoline | 33411 | Upbound | 5 | 1144 | 2231 | 175 | 54 | 1 | 2190 |
| Gasoline | 33411 | Upbound | 5 | 963 | 2217 | 147.6 | 52.6 | 13 | 17722 |
| Gasoline | 33411 | Upbound | 5 | 1100 | 2210 | 175 | 54 | 8 | 15316 |
| Gasoline | 33411 | Upbound | 5 | 1236 | 2200 | 259 | 52.5 | 8 | 11673 |
| Gasoline | 33411 | Upbound | 5 | 1002 | 2100 | 175 | 54 | 2 | 6327 |
| Gasoline | 33411 | Upbound | 5 | 1296 | 2100 | 200.1 | 52.5 | 4 | 8864 |
| Gasoline | 33411 | Upbound | 5 | 1260 | 2050 | 236 | 52.5 | 1 | 1523 |
| Gasoline | 33411 | Upbound | 5 | 1260 | 2050 | 236 | 52.5 | 1 | 1983 |
| Gasoline | 33411 | Upbound | 5 | 713 | 2048 | 195 | 35 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 1034 | 1965 | 155 | 54 | 6 | 10359 |
| Gasoline | 33411 | Upbound | 5 | 1012 | 1939 | 155 | 54 | 8 | 14139 |
| Gasoline | 33411 | Upbound | 5 | 1012 | 1939 | 155 | 54 | 4 | 7339 |
| Gasoline | 33411 | Upbound | 5 | 807 | 1848 | 148.1 | 54.1 | 4 | 6369 |
| Gasoline | 33411 | Upbound | 5 | 807 | 1848 | 148.1 | 54.1 | 23 | 38521 |
| Gasoline | 33411 | Upbound | 5 | 796 | 1800 | 147.6 | 54 | 1 | 778 |
| Gasoline | 33411 | Upbound | 5 | 796 | 1800 | 147.6 | 54 | 0 | 454 |
| Gasoline | 33411 | Upbound | 5 | 796 | 1800 | 147.6 | 54 | 1 | 1649 |
| Gasoline | 33411 | Upbound | 5 | 896 | 1800 | 147.5 | 54 | 1 | 1621 |
| Gasoline | 33411 | Upbound | 5 | 1025 | 1800 | 150 | 52.5 | 1 | 1737 |
| Gasoline | 33411 | Upbound | 5 | 1025 | 1800 | 150 | 52.5 | 19 | 31409 |
| Gasoline | 33411 | Upbound | 5 | 1152 | 1800 | 147.8 | 54 | 1 | 1592 |

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| Com Name | COMMODITY | DIRECTION | ESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Gasoline | 33411 | Upbound | 5 | 1152 | 1800 | 147.8 | 54 | 2 | 6486 |
| Gasoline | 33411 | Upbound | 5 | 716 | 1780 | 195 | 35 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 800 | 1701 | 195 | 35 | 1 | 1463 |
| Gasoline | 33411 | Upbound | 5 | 806 | 1700 | 147.6 | 54 | 3 | 5157 |
| Gasoline | 33411 | Upbound | 5 | 799 | 1690 | 195 | 35 | 1 | 778 |
| Gasoline | 33411 | Upbound | 5 | 950 | 1671 | 210 | 35 | 2 | 2344 |
| Gasoline | 33411 | Downbound | 5 | 820 | 1624 | 195 | 35 | 1 | 1381 |
| Gasoline | 33411 | Upbound | 5 | 890 | 1590 | 200 | 35 | 2 | 2995 |
| Gasoline | 33411 | Upbound | 5 | 890 | 1590 | 200 | 35 | 1 | 1598 |
| Gasoline | 33411 | Upbound | 5 | 891 | 1580 | 200 | 35 | 1 | 1505 |
| Gasoline | 33411 | Upbound | 5 | 735 | 1571 | 200 | 35 | 1 | 1600 |
| Gasoline | 33411 | Upbound | 5 | 735 | 1567 | 200 | 35 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 716 | 1559 | 195 | 35 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 698 | 1539 | 147.2 | 50 | 1 | 1559 |
| Gasoline | 33411 | Upbound | 5 | 735 | 1491 | 200 | 35 | 3 | 4200 |
| Gasoline | 33411 | Downbound | 5 | 766 | 1485 | 195 | 35 | 1 | 1327 |
| Gasoline | 33411 | Upbound | 5 | 774 | 1485 | 195 | 35 | 1 | 1297 |
| Gasoline | 33411 | Downbound | 5 | 798 | 1477 | 195 | 35 | 1 | 1361 |
| Gasoline | 33300 | Downbound | 5 | 837 | 1470 | 195 | 35 | 1 | 1503 |
| Gasoline | 33411 | Upbound | 5 | 698 | 1466 | 195 | 35 | 2 | 2800 |
| Gasoline | 33411 | Upbound | 5 | 683 | 1457 | 131 | 50 | 1 | 1482 |
| Gasoline | 33411 | Upbound | 5 | 716 | 1454 | 195 | 35 | 1 | 1400 |
| Gasoline | 33411 | Downbound | 5 | 795 | 1450 | 195 | 35 | 1 | 1451 |
| Gasoline | 33411 | Upbound | 5 | 751 | 1448 | 195 | 35 | 1 | 1472 |
| Gasoline | 33411 | Upbound | 5 | 705 | 1437 | 200 | 35 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 835 | 1426 | 195 | 35 | 1 | 1118 |
| Gasoline | 33411 | Upbound | 5 | 835 | 1426 | 195 | 35 | 1 | 1400 |
| Gasoline | 33411 | Downbound | 5 | 773 | 1350 | 195 | 35 | 2 | 2720 |
| Gasoline | 33411 | Upbound | 5 | 914 | 1350 | 195 | 35 | 1 | 1503 |
| Gasoline | 33411 | Upbound | 5 | 699 | 1348 | 120 | 50 | 7 | 6511 |
| Gasoline | 33411 | Upbound | 5 | 805 | 1275 | 147.6 | 54.1 | 18 | 28262 |
| Gasoline | 33411 | Upbound | 5 | 805 | 1275 | 147.6 | 54.1 | 1 | 1557 |
| | | | | | | "Zero" TRIPS | | 74 | |
| | | | | | | Sum all TRIPS and TONS | | 1109 | 2974473 |
| | | | | | | | | TONS/TRIP | 2682 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1959 | 5654 | 359 | 54 | 0 | 2957 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1980 | 5300 | 360.1 | 54.1 | 0 | 15285 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1992 | 5000 | 295.1 | 54 | 6 | 21003 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1754 | 4968 | 297.5 | 54 | 3 | 8630 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1754 | 4968 | 297.5 | 54 | 1 | 3960 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1936 | 4850 | 290 | 54 | 2 | 7779 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 4802 | 297.5 | 54 | 1 | 2216 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4802 | 297.5 | 54 | 1 | 1245 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4802 | 297.5 | 54 | 1 | 2102 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4802 | 297.5 | 54 | 0 | 8302 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4802 | 297.5 | 54 | 1 | 3735 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1681 | 4802 | 297.5 | 54 | 0 | 1176 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1681 | 4802 | 297.5 | 54 | 3 | 11166 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1754 | 4566 | 297.5 | 54 | 1 | 3400 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 4528 | 300 | 54 | 1 | 3074 |

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| Com Name | COMMODITY | DIRECTION | VESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1732 | 4528 | 295 | 54 | 1 | 3350 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1732 | 4528 | 295 | 54 | 3 | 11266 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1961 | 4482 | 297.5 | 54 | 1 | 3647 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 1 | 1216 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 1 | 1488 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 0 | 6141 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 1 | 3373 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 7 | 25953 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 1 | 4937 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 1477 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 2497 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 3569 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 8 | 11912 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 1484 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 12 | 49446 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 2418 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 7 | 22865 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 36 | 130392 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 2 | 7867 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 2 | 10113 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1754 | 4338 | 297.5 | 54 | 1 | 3000 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1754 | 4338 | 297.5 | 54 | 1 | 3000 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1754 | 4338 | 297.5 | 54 | 2 | 6000 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1892 | 4305 | 297.5 | 54 | 1 | 3531 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1754 | 4290 | 297.5 | 54 | 6 | 20400 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2264 | 4289 | 297 | 54 | 18 | 63340 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2016 | 4260 | 297.5 | 54 | 1 | 3643 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4200 | 297.5 | 54 | 0 | 11874 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 2033 | 4196 | 297 | 54 | 1 | 3171 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1400 | 4196 | 297 | 54 | 2 | 7219 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2012 | 4180 | 300 | 54 | 1 | 3603 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2012 | 4180 | 300 | 54 | 1 | 3700 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1897 | 4059 | 297.5 | 54 | 2 | 7643 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4054 | 297.5 | 54 | 32 | 68615 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4048 | 297.5 | 54 | 1 | 1504 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4048 | 297.5 | 54 | 0 | 7367 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4048 | 297.5 | 54 | 2 | 7448 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4048 | 297.5 | 54 | 2 | 7143 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4048 | 297.5 | 54 | 1 | 3683 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1891 | 4031 | 281.7 | 54 | 4 | 15560 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3988 | 297.6 | 54 | 21 | 71929 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1720 | 3952 | 295 | 54 | 17 | 61214 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 1 | 2786 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 6 | 19198 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 3 | 9386 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 8 | 21194 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3693 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3163 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 13 | 41256 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 16 | 44128 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 6 | 18287 |

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| Com Name | COMMODITY | DIRECTION | ESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 4 | 15284 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 19 | 66845 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 2 | 7537 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 20 | 73872 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 2 | 7386 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 4 | 14357 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3749 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 74 | 261264 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 45 | 157806 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1488 | 3800 | 295.1 | 54.1 | 2 | 5375 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1702 | 3796 | 297.6 | 54.1 | 3 | 11370 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2071 | 3740 | 300 | 54 | 1 | 3724 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1717 | 3725 | 297.5 | 54 | 1 | 3706 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1717 | 3725 | 297.6 | 54 | 4 | 15909 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1717 | 3724 | 297.5 | 54 | 5 | 17575 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1754 | 3700 | 297.5 | 54 | 1 | 3400 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3700 | 297.5 | 54 | 1 | 3844 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1897 | 3688 | 290 | 54 | 2 | 6910 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1897 | 3688 | 290 | 54 | 7 | 27022 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2045 | 3688 | 290 | 54 | 2 | 7779 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1740 | 3674 | 297.6 | 54.1 | 1 | 2700 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 844 | 3663 | 155 | 54 | 9 | 18448 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3662 | 297.5 | 54 | 3 | 10609 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3656 | 297.5 | 54 | 2 | 5784 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 16 | 46480 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 2 | 6393 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 3 | 11855 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1660 | 3656 | 297.6 | 54 | 1 | 2142 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1660 | 3656 | 297.6 | 54 | 1 | 2285 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3646 | 297.5 | 54 | 6 | 20898 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1574 | 3633 | 297.5 | 52.5 | 17 | 43740 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1574 | 3633 | 297.5 | 52.5 | 1 | 3724 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1830 | 3625 | 295 | 54 | 2 | 6746 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1344 | 3622 | 264.1 | 50 | 1 | 1111 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1344 | 3622 | 264.1 | 50 | 0 | 2221 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1344 | 3622 | 264.1 | 50 | 2 | 3470 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1754 | 3595 | 297.5 | 54 | 1 | 2641 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1754 | 3595 | 297.5 | 54 | 2 | 7681 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3576 | 297.5 | 54 | 2 | 6298 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1710 | 3571 | 297.5 | 54 | 2 | 6786 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1710 | 3571 | 297.5 | 54 | 6 | 20641 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1721 | 3525 | 297.5 | 54 | 1 | 2779 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1721 | 3525 | 297.5 | 54 | 2 | 5119 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1710 | 3525 | 297.5 | 54 | 4 | 13672 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1710 | 3525 | 297.6 | 54 | 10 | 34499 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1721 | 3525 | 297.5 | 54 | 1 | 2954 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1440 | 3523 | 272.5 | 50 | 7 | 19026 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1706 | 3505 | 297.6 | 54.1 | 1 | 2641 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1706 | 3505 | 297.6 | 54.1 | 1 | 3781 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1566 | 3500 | 297 | 54 | 5 | 14314 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1943 | 3500 | 295 | 54 | 4 | 13872 |

Waterborne Commerce Statistics Center MS River Transport Data - 2003

| Com Name | COMMODITY | DIRECTION | ESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1943 | 3500 | 295 | 54 | 1 | 3903 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2033 | 3446 | 297.5 | 54 | 1 | 3574 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1424 | 3397 | 312 | 50 | 10 | 25770 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1424 | 3397 | 272.5 | 50 | 13 | 34331 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1762 | 3397 | 252.5 | 50 | 8 | 23360 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1424 | 3390 | 272.6 | 50 | 19 | 51955 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1660 | 3373 | 297.5 | 54 | 1 | 2224 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1660 | 3373 | 297.5 | 54 | 1 | 2925 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1660 | 3373 | 297.5 | 54 | 1 | 3100 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1653 | 3363 | 297.6 | 54.1 | 1 | 3113 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1653 | 3363 | 297.6 | 54.1 | 3 | 11092 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1637 | 3350 | 297.5 | 54 | 1 | 3699 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1653 | 3350 | 297.6 | 54 | 0 | 3474 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1653 | 3350 | 297.6 | 54 | 1 | 3474 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1659 | 3317 | 297.5 | 54 | 2 | 7302 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1637 | 3300 | 297.5 | 54 | 1 | 3014 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1798 | 3300 | 295 | 50 | 2 | 6352 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2049 | 3300 | 297.5 | 54 | 2 | 6530 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2049 | 3300 | 297.5 | 54 | 20 | 72238 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2049 | 3300 | 297.5 | 54 | 21 | 79624 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2049 | 3300 | 297.5 | 54 | 2 | 7627 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2082 | 3300 | 297.5 | 54 | 1 | 3619 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1689 | 3283 | 297.6 | 54.1 | 2 | 7597 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1754 | 3283 | 297.5 | 54 | 4 | 13657 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1789 | 3280 | 295.1 | 54 | 2 | 6106 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3220 | 295 | 50 | 1 | 2911 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3220 | 297.5 | 54 | 2 | 6792 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1807 | 3200 | 290 | 54 | 1 | 2569 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3200 | 297.5 | 54 | 0 | 4767 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3200 | 297.5 | 54 | 1 | 2227 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3200 | 297.5 | 54 | 1 | 3169 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3200 | 297.5 | 54 | 8 | 29578 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1807 | 3200 | 290 | 54 | 5 | 15955 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1807 | 3200 | 290 | 54 | 4 | 13343 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1850 | 3149 | 290 | 52.5 | 3 | 8557 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1641 | 3119 | 297.6 | 54 | 1 | 3061 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1489 | 3118 | 297.6 | 54.1 | 3 | 11005 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1489 | 3117 | 297.6 | 54.1 | 4 | 14487 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1839 | 3100 | 290 | 52.5 | 1 | 2468 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2014 | 3100 | 290 | 52.5 | 3 | 10706 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1543 | 3070 | 264 | 54 | 8 | 20755 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1632 | 3000 | 300 | 54 | 2 | 4852 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1714 | 3000 | 295 | 50 | 2 | 5849 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1714 | 3000 | 295 | 50 | 1 | 2934 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1464 | 3000 | 267 | 52.5 | 11 | 31364 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1543 | 3000 | 280 | 54 | 31 | 81528 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2228 | 3000 | 297.5 | 52.5 | 2 | 7121 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1487 | 2964 | 264 | 54 | 16 | 32930 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1555 | 2964 | 264 | 54 | 1 | 1223 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1675 | 2954 | 264 | 54 | 10 | 29826 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1992 | 2890 | 180 | 54 | 6 | 15482 |

Waterborne Commerce Statistics Center MS River Transport Data - 2003

| Com Name | COMMODITY | DIRECTION | VESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1467 | 2882 | 275 | 54 | 13 | 37401 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 2812 | 297.5 | 54 | 1 | 2310 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 2812 | 297.5 | 54 | 3 | 10874 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1521 | 2800 | 295 | 54 | 1 | 3179 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1521 | 2800 | 295.1 | 54 | 1 | 3111 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1371 | 2780 | 225 | 54 | 1 | 2429 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1371 | 2780 | 225 | 54 | 1 | 2482 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2147 | 2700 | 297.5 | 54 | 1 | 3693 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1760 | 2593 | 297.6 | 54.1 | 14 | 48892 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1326 | 2570 | 215 | 54 | 1 | 2722 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 925 | 2500 | 170 | 54 | 2 | 3642 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1454 | 2500 | 295 | 54 | 1 | 2448 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1455 | 2500 | 290 | 54 | 2 | 5316 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1038 | 2500 | 155.1 | 54 | 6 | 10196 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1146 | 2460 | 175 | 50 | 3 | 5777 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1177 | 2460 | 175.1 | 50 | 6 | 10956 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1344 | 2440 | 264 | 50 | 1 | 896 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1344 | 2440 | 264 | 50 | 2 | 5592 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1088 | 2400 | 200 | 54 | 1 | 1719 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1088 | 2400 | 200 | 54 | 1 | 2059 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1300 | 2340 | 220 | 50 | 1 | 2099 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1300 | 2340 | 220 | 50 | 1 | 2069 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1088 | 2300 | 200 | 54 | 1 | 1958 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 960 | 2300 | 147.5 | 54 | 1 | 1939 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 2290 | 147.6 | 54 | 2 | 3576 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1144 | 2231 | 175 | 54 | 3 | 6637 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1144 | 2231 | 175 | 54 | 11 | 24058 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1144 | 2231 | 175 | 54 | 14 | 31761 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1144 | 2231 | 175 | 54 | 14 | 31224 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1100 | 2210 | 175 | 54 | 10 | 22394 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1236 | 2200 | 259 | 52.5 | 5 | 9919 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1002 | 2100 | 175 | 54 | 6 | 11551 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1296 | 2100 | 200.1 | 52.5 | 11 | 25189 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 735 | 2090 | 200 | 35 | 1 | 1342 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1034 | 1965 | 155 | 54 | 19 | 35279 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1012 | 1939 | 155 | 54 | 1 | 1937 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1012 | 1939 | 155 | 54 | 2 | 2537 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1012 | 1939 | 155 | 54 | 9 | 18592 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 825 | 1814 | 147 | 54 | 2 | 3468 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 825 | 1814 | 147.6 | 54.1 | 1 | 1757 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 730 | 1800 | 195 | 35 | 2 | 2430 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 896 | 1800 | 147.5 | 54 | 1 | 1788 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1025 | 1800 | 150 | 52.5 | 1 | 1788 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1152 | 1800 | 147.8 | 54 | 2 | 3817 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 716 | 1780 | 195 | 35 | 0 | 1801 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 716 | 1780 | 195 | 35 | 1 | 1490 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 716 | 1780 | 195 | 35 | 1 | 1565 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 805 | 1762 | 195 | 35 | 2 | 2401 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 805 | 1762 | 195 | 35 | 3 | 3772 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 805 | 1762 | 195 | 35 | 2 | 2862 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 806 | 1740 | 200 | 35 | 1 | 1291 |

Waterborne Commerce Statistics Center MS River Transport Data - 2003

| Com Name | COMMODITY | DIRECTION | VESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Dist. Fuel Oil | 33419 | Upbound | 5 | 860 | 1740 | 195 | 35 | 1 | 628 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 860 | 1740 | 195 | 35 | 1 | 1249 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 860 | 1740 | 195 | 35 | 1 | 1340 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 812 | 1703 | 147.6 | 54 | 1 | 1732 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1700 | 147.6 | 54 | 2 | 2816 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1700 | 147.6 | 54 | 1 | 1596 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 983 | 1700 | 155 | 54 | 4 | 8756 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 983 | 1700 | 155 | 54 | 3 | 5771 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 894 | 1660 | 195 | 35 | 6 | 8003 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 894 | 1660 | 195 | 35 | 1 | 1414 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 886 | 1586 | 200 | 35 | 1 | 1440 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 886 | 1586 | 200 | 35 | 1 | 1607 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1577 | 500 | 35 | 7 | 9522 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 698 | 1539 | 147.2 | 50 | 5 | 8186 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 550 | 1500 | 135.1 | 50.1 | 1 | 1378 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 735 | 1500 | 200 | 35 | 2 | 2829 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 730 | 1500 | 138 | 52.5 | 2 | 3579 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 773 | 1500 | 195 | 35 | 0 | 3202 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 773 | 1500 | 195 | 35 | 1 | 1607 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1469 | 200 | 35 | 1 | 993 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1469 | 200 | 35 | 1 | 1277 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1469 | 200 | 35 | 3 | 3933 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1469 | 200 | 35 | 1 | 1640 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 795 | 1465 | 195 | 35 | 1 | 665 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 795 | 1465 | 195 | 35 | 2 | 2170 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 795 | 1465 | 195 | 35 | 2 | 2667 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 795 | 1465 | 195 | 35 | 5 | 6927 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 800 | 1465 | 195 | 35 | 2 | 2039 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 800 | 1465 | 195 | 35 | 1 | 1183 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 800 | 1465 | 195 | 35 | 2 | 2646 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 800 | 1465 | 195 | 35 | 1 | 1641 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 716 | 1464 | 195 | 35 | 1 | 1490 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 766 | 1458 | 195 | 35 | 2 | 3130 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 683 | 1457 | 131 | 50 | 2 | 2948 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 812 | 1432 | 195 | 35 | 1 | 1607 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 699 | 1402 | 123.1 | 50.1 | 1 | 1328 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 798 | 1400 | 155 | 54 | 2 | 3150 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 750 | 1400 | 195 | 35 | 1 | 1565 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 796 | 1400 | 130 | 54 | 1 | 1054 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 796 | 1400 | 130 | 54 | 1 | 1284 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 809 | 1382 | 195 | 35 | 1 | 1440 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1360 | 200 | 35 | 1 | 484 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1360 | 200 | 35 | 5 | 6434 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1360 | 200 | 35 | 1 | 1545 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 809 | 1350 | 195 | 35 | 0 | 1400 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 809 | 1350 | 195 | 35 | 1 | 1607 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 914 | 1350 | 195 | 35 | 1 | 1490 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 847 | 1330 | 195 | 35 | 1 | 1607 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 824 | 1320 | 195 | 35 | 1 | 1565 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 805 | 1275 | 147.6 | 54.1 | 1 | 1927 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 725 | 1242 | 99.4 | 54 | 12 | 14273 |

Waterborne Commerce Statistics Center MS River Transport Data - 2003

| Com Name | COMMODITY | DIRECTION | VESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | "Zero" TRIPS | | 69 | |
| | | | | | | Sum all TRIPS and TONS | | 1207 | 3340011 |
| | | | | | | | | TONS/TRIP | 2767 |
| Napth & Solv | 33429 | Upbound | 5 | 1992 | **5000** | 295.1 | 54 | 1 | 4532 |
| Napth & Solv | 33429 | Upbound | 5 | 1936 | 4850 | 290 | 54 | 1 | 2715 |
| Napth & Solv | 33429 | Upbound | 5 | 1936 | 4850 | 290 | 54 | 1 | 3693 |
| Napth & Solv | 33429 | Downbound | 5 | 1681 | 4802 | 297.5 | 54 | 2 | 5553 |
| Napth & Solv | 33429 | Upbound | 5 | 1732 | 4528 | 295 | 54 | 2 | 8454 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 2 | 6430 |
| Napth & Solv | 33429 | Downbound | 5 | 1754 | 4338 | 297.5 | 54 | 2 | 6000 |
| Napth & Solv | 33429 | Upbound | 5 | 1754 | 4338 | 297.5 | 54 | 2 | 6000 |
| Napth & Solv | 33429 | Upbound | 5 | 1754 | 4338 | 297.5 | 54 | 2 | 6000 |
| Napth & Solv | 33429 | Upbound | 5 | 1892 | 4305 | 297.5 | 54 | 1 | 3408 |
| Napth & Solv | 33429 | Upbound | 5 | 1754 | 4290 | 297.5 | 54 | 2 | 6000 |
| Napth & Solv | 33429 | Upbound | 5 | 2016 | 4260 | 297.5 | 54 | 0 | 1652 |
| Napth & Solv | 33429 | Upbound | 5 | 2016 | 4260 | 297.5 | 54 | 3 | 4860 |
| Napth & Solv | 33429 | Upbound | 5 | 2026 | 4260 | 297.5 | 54 | 0 | 7303 |
| Napth & Solv | 33429 | Upbound | 5 | 2026 | 4260 | 297.5 | 54 | 1 | 1709 |
| Napth & Solv | 33429 | Upbound | 5 | 1400 | 4196 | 297 | 54 | 2 | 8434 |
| Napth & Solv | 33429 | Upbound | 5 | 2012 | 4180 | 300 | 54 | 1 | 2306 |
| Napth & Solv | 33429 | Downbound | 5 | 2029 | 4158 | 300 | 54 | 1 | 2713 |
| Napth & Solv | 33429 | Upbound | 5 | 1993 | 3998 | 297.6 | 54 | 1 | 436 |
| Napth & Solv | 33429 | Upbound | 5 | 1993 | 3998 | 297.6 | 54 | 1 | 874 |
| Napth & Solv | 33429 | Upbound | 5 | 1993 | 3998 | 297.6 | 54 | 0 | 3308 |
| Napth & Solv | 33429 | Upbound | 5 | 1993 | 3998 | 297.6 | 54 | 0 | 2808 |
| Napth & Solv | 33429 | Upbound | 5 | 1993 | 3998 | 297.6 | 54 | 2 | 3009 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 2 | 6228 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3408 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 5 | 17040 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 1 | 3408 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 2 | 6379 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 15 | 48153 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3366 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 2 | 6691 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 24 | 78377 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 23 | 76550 |
| Napth & Solv | 33429 | Upbound | 5 | 1717 | 3725 | 297.6 | 54 | 1 | 3408 |
| Napth & Solv | 33429 | Upbound | 5 | 1717 | 3724 | 297.5 | 54 | 1 | 4118 |
| Napth & Solv | 33429 | Upbound | 5 | 2045 | 3688 | 290 | 54 | 1 | 2715 |
| Napth & Solv | 33429 | Upbound | 5 | 2045 | 3688 | 290 | 54 | 1 | 3693 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 1 | 3119 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 2 | 6600 |
| Napth & Solv | 33429 | Upbound | 5 | 1660 | 3656 | 297.6 | 54 | 1 | 2633 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3576 | 297.5 | 54 | 1 | 4118 |
| Napth & Solv | 33429 | Upbound | 5 | 1710 | 3525 | 297.6 | 54 | 1 | 3408 |
| Napth & Solv | 33429 | Upbound | 5 | 1721 | 3525 | 297.5 | 54 | 1 | 2937 |
| Napth & Solv | 33429 | Upbound | 5 | 1424 | 3397 | 312 | 50 | 1 | 2965 |
| Napth & Solv | 33429 | Upbound | 5 | 1424 | 3397 | 272.5 | 50 | 1 | 2965 |
| Napth & Solv | 33429 | Upbound | 5 | 1424 | 3390 | 272.6 | 50 | 1 | 2965 |
| Napth & Solv | 33429 | Upbound | 5 | 1754 | 3283 | 297.5 | 54 | 1 | 4118 |

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| Com Name | COMMODITY | DIRECTION | VESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Napth & Solv | 33429 | Downbound | 5 | 1489 | 3118 | 297.6 | 54.1 | 1 | 2713 |
| Napth & Solv | 33429 | Downbound | 5 | 1487 | 2964 | 264 | 54 | 1 | 4318 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 2812 | 297.5 | 54 | 4 | 13006 |
| Napth & Solv | 33429 | Upbound | 5 | 1146 | 2460 | 175 | 50 | 1 | 2390 |
| Napth & Solv | 33429 | Upbound | 5 | 1177 | 2460 | 175.1 | 50 | 1 | 2389 |
| Napth & Solv | 33429 | Upbound | 5 | 1088 | 2400 | 200 | 54 | 1 | 1928 |
| Napth & Solv | 33429 | Upbound | 5 | 2223 | 2200 | 297.5 | 54 | 1 | 3408 |
| Napth & Solv | 33429 | Downbound | 5 | 1012 | 1939 | 155 | 54 | 1 | 2504 |
| Napth & Solv | 33429 | Upbound | 5 | 880 | 1823 | 147.5 | 54 | 0 | 841 |
| Napth & Solv | 33429 | Upbound | 5 | 880 | 1823 | 147.5 | 54 | 3 | 3481 |
| Napth & Solv | 33429 | Upbound | 5 | 774 | 1811 | 195 | 35 | 1 | 1520 |
| Napth & Solv | 33429 | Upbound | 5 | 766 | 1739 | 195 | 35 | 1 | 1039 |
| Napth & Solv | 33429 | Upbound | 5 | 907 | 1739 | 206 | 38 | 1 | 1526 |
| Napth & Solv | 33429 | Upbound | 5 | 799 | 1690 | 195 | 35 | 1 | 1413 |
| Napth & Solv | 33429 | Upbound | 5 | 698 | 1688 | 195 | 35 | 2 | 2320 |
| Napth & Solv | 33429 | Upbound | 5 | 698 | 1688 | 195 | 35 | 1 | 1498 |
| Napth & Solv | 33429 | Upbound | 5 | 716 | 1680 | 195 | 35 | 1 | 1453 |
| Napth & Solv | 33429 | Upbound | 5 | 716 | 1680 | 195 | 35 | 1 | 1268 |
| Napth & Solv | 33429 | Upbound | 5 | 774 | 1600 | 195 | 35 | 1 | 1339 |
| Napth & Solv | 33429 | Upbound | 5 | 774 | 1600 | 195 | 35 | 2 | 2822 |
| Napth & Solv | 33429 | Upbound | 5 | 716 | 1559 | 195 | 35 | 1 | 1335 |
| Napth & Solv | 33429 | Upbound | 5 | 735 | 1500 | 200 | 35 | 1 | 1432 |
| Napth & Solv | 33429 | Upbound | 5 | 822 | 1500 | 200 | 35 | 2 | 2983 |
| Napth & Solv | 33429 | Upbound | 5 | 735 | 1491 | 200 | 35 | 1 | 1192 |
| Napth & Solv | 33429 | Upbound | 5 | 766 | 1485 | 195 | 35 | 1 | 1200 |
| Napth & Solv | 33429 | Upbound | 5 | 774 | 1484 | 195 | 35 | 1 | 1431 |
| Napth & Solv | 33429 | Downbound | 5 | 775 | 1477 | 195 | 35 | 1 | 1418 |
| Napth & Solv | 33429 | Upbound | 5 | 812 | 1477 | 195 | 35 | 1 | 1382 |
| Napth & Solv | 33429 | Downbound | 5 | 687 | 1475 | 195 | 35 | 1 | 1417 |
| Napth & Solv | 33429 | Upbound | 5 | 766 | 1450 | 195 | 35 | 1 | 1159 |
| Napth & Solv | 33429 | Upbound | 5 | 705 | 1437 | 200 | 35 | 1 | 1571 |
| Napth & Solv | 33429 | Upbound | 5 | 716 | 1431 | 195 | 35 | 2 | 2832 |
| Napth & Solv | 33429 | Upbound | 5 | 716 | 1431 | 195 | 35 | 2 | 2789 |
| Napth & Solv | 33429 | Upbound | 5 | 835 | 1426 | 195 | 35 | 1 | 832 |
| Napth & Solv | 33429 | Upbound | 5 | 835 | 1426 | 195 | 35 | 3 | 3428 |
| Napth & Solv | 33429 | Upbound | 5 | 835 | 1426 | 195 | 35 | 1 | 1400 |
| Napth & Solv | 33429 | Upbound | 5 | 835 | 1426 | 195 | 35 | 1 | 2715 |
| Napth & Solv | 33429 | Downbound | 5 | 735 | 1400 | 200 | 35 | 1 | 1437 |
| Napth & Solv | 33429 | Upbound | 5 | 735 | 1400 | 200 | 35 | 1 | 1384 |
| Napth & Solv | 33429 | Upbound | 5 | 735 | 1400 | 200 | 35 | 3 | 4261 |
| Napth & Solv | 33429 | Upbound | 5 | 766 | 1400 | 195 | 35 | 1 | 1412 |
| Napth & Solv | 33429 | Upbound | 5 | 780 | 1400 | 200 | 35.1 | 1 | 1346 |
| Napth & Solv | 33429 | Upbound | 5 | 793 | 1400 | 195 | 35 | 1 | 1422 |
| Napth & Solv | 33429 | Upbound | 5 | 796 | 1400 | 130 | 54 | 1 | 1159 |
| Napth & Solv | 33429 | Upbound | 5 | 774 | 1379 | 195 | 35 | 1 | 1138 |
| Napth & Solv | 33429 | Upbound | 5 | 774 | 1379 | 195 | 35 | 1 | 1472 |
| Napth & Solv | 33429 | Downbound | 5 | 806 | 1360 | 200 | 35 | 1 | 1196 |
| Napth & Solv | 33429 | Upbound | 5 | 907 | 1338 | 206 | 38 | 1 | 1520 |
| Napth & Solv | 33429 | Upbound | 5 | 772 | 1300 | 195 | 35 | 1 | 1452 |
| | | | | | | | "Zero" TRIPS | 24 | |
| | | | | | | | Sum all TRIPS and TONS | 207 | 500450 |

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| Com Name | COMMODITY | DIRECTION | VESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | TONS/TRIP | 2418 |
| LNG | 34000 | Upbound | 5 | 1936 | 4850 | 290 | 54 | 1 | 3164 |
| LNG | 34000 | Upbound | 5 | 1891 | 4031 | 281.7 | 54 | 1 | 3039 |
| LNG | 34000 | Upbound | 5 | 1897 | 3688 | 290 | 54 | 1 | 3039 |
| LNG | 34000 | Upbound | 5 | 2045 | 3688 | 290 | 54 | 1 | 3164 |
| LNG | 34000 | Upbound | 5 | 1740 | 3674 | 297.6 | 54.1 | 1 | 2938 |
| LNG | 34000 | Upbound | 5 | 1489 | 3118 | 297.6 | 54.1 | 1 | 2938 |
| LNG | 34000 | Downbound | 5 | 2812 | 2474 | 355 | 53 | 1 | 2457 |
| LNG | 34000 | Downbound | 5 | 2812 | 2474 | 355 | 53 | 1 | 2488 |
| LNG | 34000 | Downbound | 5 | 2435 | 2404 | 320 | 53.6 | 2 | 4829 |
| LNG | 34000 | Upbound | 5 | 735 | 1491 | 200 | 35 | 1 | 1400 |
| LNG | 34000 | Upbound | 5 | 2167 | 1474 | 256 | 53 | 3 | 3773 |
| LNG | 34000 | Upbound | 5 | 1022 | 1230 | 218 | 42 | 1 | 837 |
| LNG | 34000 | Upbound | 5 | 1022 | 1230 | 218 | 42 | 1 | 1041 |
| LNG | 34000 | Upbound | 5 | 1022 | 1230 | 218 | 42 | 1 | 1080 |
| LNG | 34000 | Upbound | 5 | 1236 | 1200 | 260 | 42 | 0 | 1251 |
| LNG | 34000 | Upbound | 5 | 1236 | 1200 | 260 | 42 | 1 | 1283 |
| LNG | 34000 | Upbound | 5 | 1068 | 1021 | 175.1 | 42.1 | 5 | 4217 |
| LNG | 34000 | Upbound | 5 | 1068 | 1021 | 175.1 | 42.1 | 36 | 37315 |
| LNG | 34000 | Upbound | 5 | 1251 | 1012 | 210.1 | 44.1 | 5 | 3876 |
| LNG | 34000 | Upbound | 5 | 1171 | 950 | 210.1 | 44.1 | 1 | 768 |
| LNG | 34000 | Upbound | 5 | 1171 | 950 | 210.1 | 44.1 | 0 | 756 |
| LNG | 34000 | Upbound | 5 | 1007 | 900 | 210.1 | 44.1 | 5 | 3764 |
| LNG | 34000 | Upbound | 5 | 1171 | 900 | 210 | 44 | 1 | 771 |
| LNG | 34000 | Upbound | 5 | 1171 | 900 | 210 | 44 | 1 | 762 |
| LNG | 34000 | Upbound | 5 | 928 | 800 | 195.1 | 44.1 | 2 | 1348 |
| | | | | | | "Zero" TRIPS | | 11 | |
| | | | | | | Sum all TRIPS and TONS | | 85 | 92298 |
| | | | | | | | | TONS/TRIP | 1086 |
| Acylic Hydr. | 51119 | Upbound | 5 | 2026 | 4260 | 297.5 | 54 | 1 | 339 |
| Acylic Hydr. | 51119 | Upbound | 5 | 2026 | 4260 | 297.5 | 54 | 1 | 723 |
| Acylic Hydr. | 51119 | Upbound | 5 | 2026 | 4260 | 297.5 | 54 | 0 | 336 |
| Acylic Hydr. | 51119 | Upbound | 5 | 1993 | 3998 | 297.6 | 54 | 1 | 1241 |
| Acylic Hydr. | 51119 | Upbound | 5 | 1993 | 3998 | 297.6 | 54 | 0 | 965 |
| Acylic Hydr. | 51119 | Upbound | 5 | 1993 | 3998 | 297.6 | 54 | 1 | 4422 |
| Acylic Hydr. | 51119 | Upbound | 5 | 880 | 1823 | 147.5 | 54 | 1 | 153 |
| Acylic Hydr. | 51119 | Upbound | 5 | 880 | 1823 | 147.5 | 54 | 0 | 406 |
| | | | | | | "Zero" TRIPS | | 9 | |
| | | | | | | Sum all TRIPS and TONS | | 14 | 8585 |
| | | | | | | | | TONS/TRIP | 613 |
| Benzene | 51122 | Upbound | 5 | 1474 | 3582 | 250 | 54 | 2 | 6800 |
| Benzene | 51122 | Downbound | 5 | 1038 | 2400 | 200 | 54 | 1 | 2254 |
| Benzene | 51122 | Upbound | 5 | 1038 | 2400 | 200 | 54 | 1 | 2441 |
| Benzene | 51122 | Downbound | 5 | 446 | 2048 | 195 | 35 | 1 | 1454 |
| Benzene | 51122 | Upbound | 5 | 896 | 1800 | 147.5 | 54 | 1 | 1542 |
| Benzene | 51122 | Upbound | 5 | 797 | 1783 | 147 | 52.5 | 1 | 1614 |
| Benzene | 51122 | Downbound | 5 | 716 | 1780 | 195 | 35 | 1 | 1427 |
| Benzene | 51122 | Upbound | 5 | 747 | 1750 | 200 | 35 | 4 | 7000 |

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| Com Name | COMMODITY | DIRECTION | ESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Benzene | 51122 | Downbound | 5 | 698 | 1688 | 195 | 35 | 1 | 1434 |
| Benzene | 51122 | Downbound | 5 | 698 | 1688 | 195 | 35 | 2 | 2945 |
| Benzene | 51122 | Upbound | 5 | 698 | 1688 | 195 | 35 | 1 | 1501 |
| Benzene | 51122 | Upbound | 5 | 809 | 1660 | 195 | 35 | 1 | 1505 |
| Benzene | 51122 | Downbound | 5 | 716 | 1559 | 195 | 35 | 1 | 1272 |
| Benzene | 51122 | Downbound | 5 | 716 | 1559 | 195 | 35 | 2 | 2863 |
| Benzene | 51122 | Downbound | 5 | 735 | 1500 | 200 | 35 | 1 | 1398 |
| Benzene | 51122 | Upbound | 5 | 822 | 1500 | 200 | 35 | 1 | 1562 |
| Benzene | 51122 | Downbound | 5 | 698 | 1466 | 195 | 35 | 1 | 1502 |
| Benzene | 51122 | Upbound | 5 | 698 | 1466 | 195 | 35 | 1 | 1419 |
| Benzene | 51122 | Upbound | 5 | 795 | 1450 | 195 | 35 | 1 | 1614 |
| Benzene | 51122 | Downbound | 5 | 735 | 1400 | 200 | 35 | 1 | 1386 |
| Benzene | 51122 | Downbound | 5 | 766 | 1400 | 195 | 35 | 1 | 1416 |
| Benzene | 51122 | Downbound | 5 | 774 | 1400 | 195 | 35 | 1 | 1200 |
| Benzene | 51122 | Downbound | 5 | 774 | 1400 | 195 | 35 | 1 | 1200 |
| Benzene | 51122 | Downbound | 5 | 774 | 1400 | 195.1 | 35.1 | 1 | 1506 |
| Benzene | 51122 | Downbound | 5 | 780 | 1400 | 200 | 35.1 | 1 | 1264 |
| Benzene | 51122 | Downbound | 5 | 774 | 1379 | 195 | 35 | 1 | 1335 |
| Benzene | 51122 | Upbound | 5 | 773 | 1350 | 195 | 35 | 1 | 1504 |
| Benzene | 51123 | Downbound | 5 | 773 | 1350 | 195 | 35 | 2 | 2913 |
| | | | | | | "Zero" TRIPS | | 0 | |
| | | | | | | Sum all TRIPS and TONS | | 35 | 57271 |
| | | | | | | | | TONS/TRIP | 1636 |
| Toluene | 51123 | Downbound | 5 | 1088 | **2400** | 200 | 54 | 1 | 2406 |
| Toluene | 51123 | Downbound | 5 | 799 | 1854 | 195 | 35 | 1 | 1392 |
| Toluene | 51123 | Downbound | 5 | 792 | 1738 | 195 | 35 | 2 | 2854 |
| Toluene | 51123 | Upbound | 5 | 698 | 1688 | 195 | 35 | 1 | 1450 |
| Toluene | 51123 | Upbound | 5 | 809 | 1660 | 195 | 35 | 1 | 1432 |
| Toluene | 51123 | Downbound | 5 | 820 | 1624 | 195 | 35 | 1 | 1436 |
| Toluene | 51123 | Upbound | 5 | 716 | 1563 | 200 | 35 | 1 | 1522 |
| Toluene | 51123 | Downbound | 5 | 774 | 1500 | 195 | 35 | 1 | 1431 |
| Toluene | 51123 | Downbound | 5 | 822 | 1500 | 200 | 35 | 1 | 1494 |
| Toluene | 51123 | Downbound | 5 | 774 | 1485 | 195 | 35 | 1 | 1461 |
| Toluene | 51123 | Upbound | 5 | 795 | 1465 | 195 | 35 | 1 | 1449 |
| Toluene | 51123 | Downbound | 5 | 795 | 1450 | 195 | 35 | 1 | 1447 |
| Toluene | 51123 | Upbound | 5 | 795 | 1450 | 195 | 35 | 1 | 1449 |
| Toluene | 51123 | Upbound | 5 | 705 | 1437 | 200 | 35 | 1 | 1516 |
| Toluene | 51123 | Upbound | 5 | 774 | 1434 | 195.1 | 35.1 | 1 | 1440 |
| Toluene | 51123 | Upbound | 5 | 795 | 1374 | 195 | 35 | 1 | 1500 |
| Toluene | 51123 | Downbound | 5 | 773 | 1350 | 195 | 35 | 2 | 2893 |
| Toluene | 51123 | Upbound | 5 | 847 | 1350 | 195 | 35 | 1 | 1466 |
| | | | | | | "Zero" TRIPS | | 0 | |
| | | | | | | Sum all TRIPS and TONS | | 20 | 30038 |
| | | | | | | | | TONS/TRIP | 1502 |
| Ammonia | 52261 | Downbound | 5 | 2502 | **2902** | 295 | 50 | 1 | 2702 |
| Ammonia | 52261 | Upbound | 5 | 2502 | 2902 | 295 | 50 | 11 | 29313 |
| Ammonia | 52261 | Upbound | 5 | 3084 | 2874 | 298 | 54 | 11 | 27500 |
| Ammonia | 52261 | Upbound | 5 | 3084 | 2874 | 298 | 54 | 21 | 52600 |
| Ammonia | 52261 | Upbound | 5 | 2688 | 2800 | 298 | 54 | 6 | 15000 |

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| Com Name | COMMODITY | DIRECTION | VESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Ammonia | 52261 | Upbound | 5 | 2688 | 2800 | 298 | 54 | 8 | 20000 |
| Ammonia | 52261 | Upbound | 5 | 2840 | 2800 | 298 | 54 | 11 | 27800 |
| Ammonia | 52261 | Upbound | 5 | 2840 | 2800 | 298 | 54 | 21 | 52500 |
| Ammonia | 52261 | Downbound | 5 | 2200 | 2720 | 270 | 53 | 2 | 5000 |
| Ammonia | 52261 | Downbound | 5 | 2328 | 2720 | 298 | 53 | 1 | 2500 |
| Ammonia | 52261 | Upbound | 5 | 2200 | 2720 | 270 | 53 | 2 | 5000 |
| Ammonia | 52261 | Upbound | 5 | 2200 | 2720 | 270 | 53 | 10 | 25000 |
| Ammonia | 52261 | Upbound | 5 | 2328 | 2720 | 298 | 53 | 12 | 30000 |
| Ammonia | 52261 | Upbound | 5 | 2328 | 2720 | 298 | 53 | 8 | 20000 |
| Ammonia | 52261 | Upbound | 5 | 2424 | 2642 | 295 | 50 | 9 | 22044 |
| Ammonia | 52261 | Upbound | 5 | 2688 | 2600 | 298 | 54 | 3 | 7500 |
| Ammonia | 52261 | Upbound | 5 | 2688 | 2600 | 298 | 54 | 12 | 30000 |
| Ammonia | 52261 | Downbound | 5 | 2356 | 2500 | 270 | 50 | 1 | 2500 |
| Ammonia | 52261 | Downbound | 5 | 2380 | 2500 | 300 | 50 | 3 | 7500 |
| Ammonia | 52261 | Downbound | 5 | 2482 | 2500 | 293 | 50 | 1 | 2500 |
| Ammonia | 52261 | Upbound | 5 | 1803 | 2500 | 295 | 52 | 21 | 52500 |
| Ammonia | 52261 | Upbound | 5 | 2356 | 2500 | 270 | 50 | 7 | 17500 |
| Ammonia | 52261 | Upbound | 5 | 2380 | 2500 | 300 | 50 | 9 | 22500 |
| Ammonia | 52261 | Upbound | 5 | 2380 | 2500 | 300 | 50 | 6 | 15000 |
| Ammonia | 52261 | Upbound | 5 | 2431 | 2500 | 280 | 50 | 2 | 5000 |
| Ammonia | 52261 | Upbound | 5 | 2476 | 2500 | 310 | 50 | 1 | 2500 |
| Ammonia | 52261 | Upbound | 5 | 2482 | 2500 | 293 | 50 | 19 | 47500 |
| Ammonia | 52261 | Upbound | 5 | 2700 | 2500 | 281 | 50 | 1 | 2500 |
| Ammonia | 52261 | Upbound | 5 | 2700 | 2500 | 281 | 50 | 8 | 20000 |
| Ammonia | 52261 | Upbound | 5 | 2917 | 2350 | 295 | 52.5 | 8 | 20000 |
| Ammonia | 52261 | Upbound | 5 | 2424 | 2213 | 295 | 50 | 14 | 35067 |
| Ammonia | 52261 | Upbound | 5 | 2424 | 2212 | 295 | 50 | 1 | 2030 |
| Ammonia | 52261 | Upbound | 5 | 2424 | 2212 | 295 | 50 | 10 | 25183 |
| Ammonia | 52261 | Upbound | 5 | 2482 | 2208 | 294 | 50 | 1 | 2493 |
| Ammonia | 52261 | Upbound | 5 | 2482 | 2203 | 294 | 50 | 2 | 4982 |
| Ammonia | 52261 | Upbound | 5 | 2482 | 2202 | 293 | 50 | 11 | 27431 |
| Ammonia | 52261 | Downbound | 5 | 2491 | 2100 | 283 | 50 | 1 | 2370 |
| Ammonia | 52261 | Upbound | 5 | 2491 | 2100 | 283 | 50 | 6 | 14259 |
| Ammonia | 52261 | Upbound | 5 | 2481 | 2098 | 283 | 50 | 11 | 26186 |
| | | | | | | | "Zero" TRIPS | 1 | |
| | | | | | | | Sum all TRIPS and TONS | 294 | 731960 |
| | | | | | | | | TONS/TRIP | 2490 |

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| Comm Name | COMMODITY | DIRECTION | VESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Crude Petrol. | 33300 | Upbound | 5 | 1619 | 4670 | 297.5 | 54 | 5 | 17508 |
| Crude Petrol. | 33300 | Upbound | 5 | 1619 | 4670 | 297.5 | 54 | 1 | 3315 |
| Crude Petrol. | 33300 | Upbound | 5 | 1619 | 4670 | 297.5 | 54 | 1 | 3830 |
| Crude Petrol. | 33300 | Downbound | 5 | 1619 | 4596 | 297 | 54 | 6 | 17748 |
| Crude Petrol. | 33300 | Upbound | 5 | 1619 | 4596 | 297 | 54 | 2 | 7346 |
| Crude Petrol. | 33300 | Upbound | 5 | 1637 | 4596 | 297.5 | 54 | 1 | 3315 |
| Crude Petrol. | 33300 | Upbound | 5 | 1637 | 4596 | 297.5 | 54 | 6 | 21338 |
| Crude Petrol. | 33300 | Downbound | 5 | 1619 | 4337 | 297.5 | 54 | 4 | 15336 |
| Crude Petrol. | 33300 | Upbound | 5 | 1619 | 4337 | 297.5 | 54 | 1 | 3282 |
| Crude Petrol. | 33300 | Upbound | 5 | 1619 | 4337 | 297.5 | 54 | 26 | 99684 |
| Crude Petrol. | 33300 | Downbound | 5 | 1488 | 3800 | 295.1 | 54.1 | 1 | 2827 |
| Crude Petrol. | 33300 | Upbound | 5 | 1754 | 3665 | 297.5 | 54 | 2 | 6889 |
| Crude Petrol. | 33300 | Upbound | 5 | 1906 | 3390 | 297 | 54 | 2 | 6567 |
| Crude Petrol. | 33300 | Upbound | 5 | 1906 | 3390 | 297 | 54 | 21 | 75345 |
| Crude Petrol. | 33300 | Upbound | 5 | 1914 | 3390 | 297 | 54 | 2 | 6567 |
| Crude Petrol. | 33300 | Upbound | 5 | 1914 | 3390 | 297 | 54 | 19 | 67895 |
| Crude Petrol. | 33300 | Upbound | 5 | 1961 | 3390 | 297 | 54 | 1 | 3342 |
| Crude Petrol. | 33300 | Upbound | 5 | 1961 | 3390 | 297 | 54 | 18 | 64510 |
| Crude Petrol. | 33300 | Upbound | 5 | 1754 | 3200 | 297.5 | 54 | 2 | 6889 |
| Crude Petrol. | 33300 | Downbound | 5 | 1916 | 3100 | 275 | 54 | 1 | 3205 |
| Crude Petrol. | 33300 | Upbound | 5 | 1898 | 3100 | 295 | 54 | 82 | 300580 |
| Crude Petrol. | 33300 | Upbound | 5 | 1916 | 3100 | 275 | 54 | 70 | 257541 |
| Crude Petrol. | 33300 | Upbound | 5 | 1918 | 3100 | 295 | 54 | 13 | 47360 |
| Crude Petrol. | 33300 | Downbound | 5 | 1521 | 2800 | 295 | 54 | 2 | 6288 |
| Crude Petrol. | 33300 | Downbound | 5 | 1454 | 2500 | 295 | 54 | 1 | 2728 |
| Crude Petrol. | 33300 | Downbound | 5 | 1455 | 2500 | 290 | 54 | 4 | 8495 |
| Crude Petrol. | 33300 | Upbound | 5 | 1754 | 2000 | 297.5 | 54 | 2 | 6446 |
| | | | | | | | "Zero" TRIPS | 0 | |
| | | | | | | | Sum all TRIPS and TONS | 296 | 1066176 |
| | | | | | | | | TONS/TRIP | 3602 |
| Gasoline | 33411 | Upbound | 5 | 1936 | 4850 | 290 | 54 | 1 | 2325 |
| Gasoline | 33411 | Upbound | 5 | 1616 | 4802 | 297 | 54 | 3 | 11409 |
| Gasoline | 33411 | Upbound | 5 | 1616 | 4802 | 297 | 54 | 3 | 11660 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4802 | 297.5 | 54 | 10 | 10621 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4802 | 297.5 | 54 | 0 | 5525 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4802 | 297.5 | 54 | 1 | 3373 |
| Gasoline | 33411 | Upbound | 5 | 2822 | 4527 | 297.6 | 54 | 1 | 3373 |
| Gasoline | 33411 | Upbound | 5 | 1961 | 4482 | 297.5 | 54 | 3 | 9729 |
| Gasoline | 33411 | Upbound | 5 | 1958 | 4420 | 297 | 52.6 | 4 | 13698 |
| Gasoline | 33411 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 1 | 411 |
| Gasoline | 33411 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 2 | 15197 |
| Gasoline | 33411 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 2 | 4952 |
| Gasoline | 33411 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 4 | 13161 |
| Gasoline | 33411 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 14 | 49690 |
| Gasoline | 33411 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 1 | 3554 |
| Gasoline | 33411 | Upbound | 5 | 2043 | 4390 | 297.5 | 54 | 1 | 3626 |
| Gasoline | 33411 | Downbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 103 |
| Gasoline | 33411 | Downbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 3280 |
| Gasoline | 33411 | Downbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 3472 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 748 |

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| Comm Name | COMMODITY | DIRECTION | VESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Gasoline | 33411 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 7 | 5894 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 15 | 16977 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 1873 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 5 | 68830 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 2 | 5381 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 37 | 123027 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 28 | 96443 |
| Gasoline | 33411 | Upbound | 5 | 1754 | 4322 | 297.5 | 54 | 12 | 44056 |
| Gasoline | 33411 | Upbound | 5 | 1754 | 4322 | 297.5 | 54 | 21 | 73258 |
| Gasoline | 33411 | Downbound | 5 | 2264 | 4289 | 297 | 54 | 0 | 2288 |
| Gasoline | 33411 | Upbound | 5 | 2264 | 4289 | 297 | 54 | 1 | 2670 |
| Gasoline | 33411 | Upbound | 5 | 2264 | 4289 | 297 | 54 | 1 | 3242 |
| Gasoline | 33411 | Downbound | 5 | 1619 | 4267 | 297.5 | 54 | 1 | 3286 |
| Gasoline | 33411 | Downbound | 5 | 1619 | 4267 | 297.5 | 54 | 2 | 6835 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4267 | 297.5 | 54 | 5 | 15484 |
| Gasoline | 33411 | Upbound | 5 | 1894 | 4234 | 297.5 | 54 | 1 | 3243 |
| Gasoline | 33411 | Upbound | 5 | 1894 | 4234 | 297.5 | 54 | 2 | 6486 |
| Gasoline | 33411 | Upbound | 5 | 1445 | 4090 | 297 | 54 | 6 | 14148 |
| Gasoline | 33411 | Upbound | 5 | 1897 | 4059 | 297.5 | 54 | 2 | 7328 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4054 | 297.5 | 54 | 2 | 10033 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4048 | 297.5 | 54 | 2 | 1299 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4048 | 297.5 | 54 | 1 | 1292 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 4048 | 297.5 | 54 | 1 | 3875 |
| Gasoline | 33411 | Upbound | 5 | 1616 | 4040 | 297 | 54 | 1 | 1099 |
| Gasoline | 33411 | Upbound | 5 | 1616 | 4040 | 297 | 54 | 0 | 7258 |
| Gasoline | 33411 | Upbound | 5 | 1616 | 4040 | 297 | 54 | 1 | 3417 |
| Gasoline | 33411 | Upbound | 5 | 1616 | 4040 | 297 | 54 | 2 | 7523 |
| Gasoline | 33411 | Downbound | 5 | 1619 | 3942 | 297.5 | 54 | 1 | 2428 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3942 | 297.5 | 54 | 2 | 6486 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3942 | 297.5 | 54 | 3 | 9729 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3939 | 297 | 54 | 26 | 97785 |
| Gasoline | 33411 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 1 | 2428 |
| Gasoline | 33411 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 6 | 16032 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 2 | 6800 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 12 | 38087 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 5 | 14042 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 1 | 3243 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 2646 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 6 | 18634 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 2 | 6080 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 2811 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 39 | 121158 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 11 | 37524 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3243 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3243 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3243 |
| Gasoline | 33411 | Upbound | 5 | 1702 | 3796 | 297.6 | 54.1 | 1 | 5397 |
| Gasoline | 33411 | Upbound | 5 | 1661 | 3792 | 295 | 54 | 32 | 92179 |
| Gasoline | 33411 | Upbound | 5 | 1717 | 3725 | 297.6 | 54 | 1 | 3243 |
| Gasoline | 33411 | Upbound | 5 | 1724 | 3725 | 297.5 | 54 | 2 | 6528 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3700 | 297.5 | 54 | 2 | 1497 |

Waterborne Commerce Statistics Center MS River Transport Data - 2004

| Comm Name | COMMODITY | DIRECTION | ESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Gasoline | 33411 | Upbound | 5 | 1619 | 3700 | 297.5 | 54 | 3 | 3275 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3700 | 297.5 | 54 | 0 | 11546 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3700 | 297.5 | 54 | 3 | 7027 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3700 | 297.5 | 54 | 1 | 3111 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3700 | 297.5 | 54 | 8 | 26742 |
| Gasoline | 33411 | Upbound | 5 | 1897 | 3688 | 290 | 54 | 1 | 3164 |
| Gasoline | 33411 | Upbound | 5 | 2044 | 3688 | 290 | 54 | 1 | 2968 |
| Gasoline | 33411 | Upbound | 5 | 2045 | 3688 | 290 | 54 | 1 | 2968 |
| Gasoline | 33411 | Upbound | 5 | 1731 | 3673 | 297.6 | 54.1 | 2 | 7073 |
| Gasoline | 33411 | Upbound | 5 | 844 | 3663 | 155 | 54 | 1 | 2595 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 1 | 1732 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 1 | 2394 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 1 | 3007 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 7 | 23173 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 2 | 7670 |
| Gasoline | 33411 | Upbound | 5 | 1660 | 3656 | 297.6 | 54 | 1 | 1418 |
| Gasoline | 33411 | Downbound | 5 | 1619 | 3646 | 297.5 | 54 | 2 | 6572 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3646 | 297.5 | 54 | 8 | 27227 |
| Gasoline | 33411 | Upbound | 5 | 1574 | 3633 | 297.5 | 52.5 | 4 | 22165 |
| Gasoline | 33411 | Upbound | 5 | 1574 | 3633 | 297.5 | 52.5 | 1 | 3151 |
| Gasoline | 33411 | Upbound | 5 | 1618 | 3632 | 297.6 | 54 | 4 | 13356 |
| Gasoline | 33411 | Upbound | 5 | 1633 | 3583 | 300 | 54 | 1 | 3286 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3579 | 297.5 | 54 | 22 | 72742 |
| Gasoline | 33411 | Upbound | 5 | 1710 | 3571 | 297.5 | 54 | 1 | 3242 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3567 | 297.5 | 54 | 1 | 3361 |
| Gasoline | 33411 | Upbound | 5 | 1710 | 3525 | 297.5 | 54 | 1 | 3242 |
| Gasoline | 33411 | Upbound | 5 | 1440 | 3523 | 272.5 | 50 | 1 | 2692 |
| Gasoline | 33411 | Upbound | 5 | 1943 | 3500 | 295 | 54 | 1 | 3242 |
| Gasoline | 33411 | Upbound | 5 | 1424 | 3397 | 312 | 50 | 4 | 10126 |
| Gasoline | 33411 | Upbound | 5 | 1424 | 3397 | 272.5 | 50 | 2 | 5258 |
| Gasoline | 33411 | Upbound | 5 | 1424 | 3390 | 272.6 | 50 | 2 | 6776 |
| Gasoline | 33411 | Upbound | 5 | 1660 | 3373 | 297.5 | 54 | 2 | 6000 |
| Gasoline | 33411 | Upbound | 5 | 1660 | 3373 | 297.5 | 54 | 1 | 3600 |
| Gasoline | 33411 | Downbound | 5 | 1659 | 3317 | 297.5 | 54 | 1 | 3155 |
| Gasoline | 33411 | Upbound | 5 | 1659 | 3317 | 297.5 | 54 | 2 | 6419 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3314 | 297.5 | 54 | 10 | 33720 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3314 | 297.6 | 54 | 3 | 13142 |
| Gasoline | 33411 | Upbound | 5 | 1754 | 3283 | 297.5 | 54 | 1 | 3242 |
| Gasoline | 33411 | Upbound | 5 | 1863 | 3203 | 290 | 52.6 | 3 | 7722 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3200 | 297.5 | 54 | 3 | 3374 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3200 | 297.5 | 54 | 0 | 4511 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3200 | 297.5 | 54 | 2 | 4646 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3200 | 297.5 | 54 | 2 | 6394 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 3200 | 297.5 | 54 | 2 | 6592 |
| Gasoline | 33411 | Upbound | 5 | 1489 | 3117 | 297.6 | 54.1 | 1 | 1823 |
| Gasoline | 33411 | Upbound | 5 | 1489 | 3117 | 297.6 | 54.1 | 2 | 4887 |
| Gasoline | 33411 | Upbound | 5 | 2014 | 3100 | 290 | 52.5 | 2 | 6484 |
| Gasoline | 33411 | Upbound | 5 | 1543 | 3070 | 264 | 54 | 10 | 26189 |
| Gasoline | 33411 | Downbound | 5 | 1464 | 3000 | 267 | 52.5 | 1 | 2209 |
| Gasoline | 33411 | Downbound | 5 | 1543 | 3000 | 280 | 54 | 1 | 2157 |
| Gasoline | 33411 | Upbound | 5 | 1464 | 3000 | 267 | 52.5 | 0 | 993 |

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| Comm Name | COMMODITY | DIRECTION | ESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Gasoline | 33411 | Upbound | 5 | 1543 | 3000 | 280 | 54 | 20 | 58092 |
| Gasoline | 33411 | Upbound | 5 | 2228 | 3000 | 297.5 | 52.5 | 11 | 37092 |
| Gasoline | 33411 | Upbound | 5 | 1487 | 2964 | 264 | 54 | 1 | 4746 |
| Gasoline | 33411 | Upbound | 5 | 1555 | 2964 | 264 | 54 | 0 | 584 |
| Gasoline | 33411 | Upbound | 5 | 1555 | 2964 | 264 | 54 | 1 | 2529 |
| Gasoline | 33411 | Upbound | 5 | 1555 | 2964 | 264 | 54 | 8 | 22703 |
| Gasoline | 33411 | Upbound | 5 | 1675 | 2954 | 264 | 54 | 1 | 584 |
| Gasoline | 33411 | Upbound | 5 | 1675 | 2954 | 264 | 54 | 0 | 2529 |
| Gasoline | 33411 | Upbound | 5 | 1675 | 2954 | 264 | 54 | 15 | 42409 |
| Gasoline | 33411 | Upbound | 5 | 1992 | 2890 | 180 | 54 | 1 | 2334 |
| Gasoline | 33411 | Upbound | 5 | 1467 | 2882 | 275 | 54 | 12 | 26938 |
| Gasoline | 33411 | Upbound | 5 | 1619 | 2812 | 297.5 | 54 | 1 | 3243 |
| Gasoline | 33411 | Upbound | 5 | 2147 | 2700 | 297.5 | 54 | 1 | 3243 |
| Gasoline | 33411 | Upbound | 5 | 759 | 2570 | 148.8 | 54.1 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 1038 | 2500 | 155.1 | 54 | 2 | 3228 |
| Gasoline | 33411 | Upbound | 5 | 1146 | 2460 | 175 | 50 | 5 | 7435 |
| Gasoline | 33411 | Upbound | 5 | 1177 | 2460 | 175.1 | 50 | 1 | 1262 |
| Gasoline | 33411 | Upbound | 5 | 806 | 2290 | 147.6 | 54 | 8 | 13617 |
| Gasoline | 33411 | Upbound | 5 | 1658 | 2273 | 297.6 | 54.1 | 1 | 2588 |
| Gasoline | 33411 | Upbound | 5 | 1144 | 2231 | 175 | 54 | 2 | 4666 |
| Gasoline | 33411 | Upbound | 5 | 1144 | 2231 | 175 | 54 | 6 | 13277 |
| Gasoline | 33411 | Upbound | 5 | 963 | 2217 | 147.6 | 52.6 | 7 | 8673 |
| Gasoline | 33411 | Upbound | 5 | 1100 | 2210 | 175 | 54 | 3 | 6638 |
| Gasoline | 33411 | Upbound | 5 | 1236 | 2200 | 259 | 52.5 | 7 | 14062 |
| Gasoline | 33411 | Upbound | 5 | 2223 | 2200 | 297.5 | 54 | 1 | 3243 |
| Gasoline | 33411 | Upbound | 5 | 1296 | 2100 | 200.1 | 52.5 | 1 | 1909 |
| Gasoline | 33411 | Upbound | 5 | 1260 | 2050 | 236 | 52.5 | 1 | 1260 |
| Gasoline | 33411 | Upbound | 5 | 446 | 2048 | 195 | 35 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 713 | 2048 | 195 | 35 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 1034 | 1965 | 155 | 54 | 2 | 3460 |
| Gasoline | 33411 | Downbound | 5 | 1012 | 1939 | 155 | 54 | 1 | 2183 |
| Gasoline | 33411 | Upbound | 5 | 1012 | 1939 | 155 | 54 | 3 | 5625 |
| Gasoline | 33411 | Upbound | 5 | 807 | 1848 | 148.1 | 54.1 | 6 | 10029 |
| Gasoline | 33411 | Upbound | 5 | 796 | 1800 | 147.6 | 54 | 5 | 7198 |
| Gasoline | 33411 | Upbound | 5 | 896 | 1800 | 147.5 | 54 | 2 | 3242 |
| Gasoline | 33411 | Upbound | 5 | 1025 | 1800 | 150 | 52.5 | 2 | 3253 |
| Gasoline | 33411 | Upbound | 5 | 716 | 1780 | 195 | 35 | 1 | 1207 |
| Gasoline | 33411 | Upbound | 5 | 716 | 1780 | 195 | 35 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 716 | 1780 | 195 | 35 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 809 | 1760 | 195 | 35 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 806 | 1700 | 147.6 | 54 | 1 | 1433 |
| Gasoline | 33411 | Upbound | 5 | 698 | 1688 | 195 | 35 | 3 | 4200 |
| Gasoline | 33411 | Upbound | 5 | 797 | 1659 | 200 | 35 | 1 | 1174 |
| Gasoline | 33411 | Upbound | 5 | 797 | 1659 | 200 | 35 | 5 | 6816 |
| Gasoline | 33411 | Upbound | 5 | 716 | 1563 | 200 | 35 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 716 | 1563 | 200 | 35 | 1 | 1600 |
| Gasoline | 33411 | Upbound | 5 | 735 | 1563 | 200 | 35 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 879 | 1520 | 200 | 35 | 1 | 1163 |
| Gasoline | 33411 | Downbound | 5 | 822 | 1500 | 200 | 35 | 1 | 1127 |
| Gasoline | 33411 | Upbound | 5 | 735 | 1491 | 200 | 35 | 1 | 8 |
| Gasoline | 33411 | Downbound | 5 | 798 | 1490 | 195 | 35 | 2 | 2718 |

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| Comm Name | COMMODITY | DIRECTION | ESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Gasoline | 33411 | Upbound | 5 | 766 | 1485 | 195 | 35 | 1 | 1172 |
| Gasoline | 33411 | Upbound | 5 | 446 | 1466 | 195 | 35 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 716 | 1464 | 195 | 35 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 716 | 1454 | 195 | 35 | 2 | 2800 |
| Gasoline | 33411 | Upbound | 5 | 716 | 1454 | 195 | 35 | 2 | 2800 |
| Gasoline | 33411 | Downbound | 5 | 795 | 1450 | 195 | 35 | 1 | 1407 |
| Gasoline | 33411 | Upbound | 5 | 751 | 1448 | 195 | 35 | 2 | 2354 |
| Gasoline | 33411 | Upbound | 5 | 380 | 1436 | 195 | 35 | 2 | 2800 |
| Gasoline | 33411 | Upbound | 5 | 835 | 1426 | 195 | 35 | 1 | 1104 |
| Gasoline | 33411 | Upbound | 5 | 835 | 1426 | 195 | 35 | 6 | 8400 |
| Gasoline | 33411 | Upbound | 5 | 773 | 1423 | 195.1 | 35.1 | 1 | 1215 |
| Gasoline | 33411 | Downbound | 5 | 774 | 1400 | 195 | 35 | 2 | 2824 |
| Gasoline | 33411 | Upbound | 5 | 774 | 1400 | 195 | 35 | 1 | 1200 |
| Gasoline | 33411 | Upbound | 5 | 774 | 1400 | 195.1 | 35.1 | 2 | 2800 |
| Gasoline | 33411 | Upbound | 5 | 809 | 1382 | 195 | 35 | 1 | 1157 |
| Gasoline | 33411 | Upbound | 5 | 809 | 1382 | 195 | 35 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 847 | 1350 | 195 | 35 | 1 | 8 |
| Gasoline | 33411 | Upbound | 5 | 847 | 1350 | 195 | 35 | 1 | 1216 |
| Gasoline | 33411 | Upbound | 5 | 847 | 1350 | 195 | 35 | 3 | 4623 |
| Gasoline | 33411 | Upbound | 5 | 914 | 1350 | 195 | 35 | 1 | 1215 |
| Gasoline | 33411 | Upbound | 5 | 914 | 1350 | 195 | 35 | 1 | 1400 |
| Gasoline | 33411 | Upbound | 5 | 1622 | 1346 | 195 | 35 | 3 | 3577 |
| Gasoline | 33411 | Upbound | 5 | 774 | 1329 | 195 | 35 | 1 | 778 |
| Gasoline | 33411 | Upbound | 5 | 805 | 1275 | 147.6 | 54.1 | 3 | 2769 |
| | | | | | | "Zero" TRIPS | | 90 | |
| | | | | | | Sum all TRIPS and TONS | | 806 | 2062837 |
| | | | | | | | | TONS/TRIP | 2559 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 2063 | 5029 | 350 | 54 | 2 | 6800 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1992 | 5000 | 295.1 | 54 | 1 | 3593 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1754 | 4968 | 297.5 | 54 | 2 | 5524 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1754 | 4968 | 297.5 | 54 | 1 | 3083 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1754 | 4968 | 297.5 | 54 | 1 | 3208 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 4802 | 297.5 | 54 | 2 | 1287 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 4802 | 297.5 | 54 | 1 | 2797 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1681 | 4802 | 297.5 | 54 | 1 | 2797 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1616 | 4802 | 297 | 54 | 3 | 11991 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4802 | 297.5 | 54 | 3 | 3295 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4802 | 297.5 | 54 | 0 | 21814 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1632 | 4744 | 300 | 54 | 1 | 3166 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1633 | 4744 | 300 | 54 | 2 | 5667 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1711 | 4715 | 295 | 54 | 2 | 6861 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1754 | 4566 | 297.5 | 54 | 1 | 3000 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1754 | 4566 | 297.5 | 54 | 2 | 6800 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2822 | 4527 | 297.6 | 54 | 2 | 7397 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1961 | 4482 | 297.5 | 54 | 1 | 1846 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1958 | 4420 | 297 | 52.6 | 6 | 20794 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 2111 | 4400 | 290 | 54 | 2 | 6197 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 0 | 1201 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1681 | 4400 | 297 | 54 | 1 | 3758 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 4351 | 297.5 | 54 | 3 | 691 |

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| Comm Name | COMMODITY | DIRECTION | ESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 304 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 4 | 3195 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 11 | 12592 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 5 | 8434 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 10 | 97789 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 2 | 5005 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 9 | 27746 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 38 | 139096 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 3894 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1754 | 4338 | 297.5 | 54 | 14 | 42000 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1754 | 4322 | 297.5 | 54 | 6 | 22725 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1892 | 4305 | 297.5 | 54 | 3 | 9232 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1754 | 4290 | 297.5 | 54 | 1 | 3400 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1754 | 4290 | 297.5 | 54 | 8 | 27200 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 2264 | 4289 | 297 | 54 | 1 | 3263 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4267 | 297.5 | 54 | 3 | 9980 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4200 | 297.5 | 54 | 0 | 4200 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2012 | 4180 | 300 | 54 | 1 | 3855 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1445 | 4090 | 297 | 54 | 0 | 4172 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1897 | 4059 | 297.5 | 54 | 2 | 6585 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1897 | 4059 | 297.5 | 54 | 5 | 17505 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4054 | 297.5 | 54 | 16 | 39475 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 4048 | 297.5 | 54 | 2 | 5845 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4048 | 297.5 | 54 | 6 | 22518 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4048 | 297.6 | 54 | 5 | 17846 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 4048 | 297.5 | 54 | 2 | 6698 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1616 | 4040 | 297 | 54 | 1 | 1181 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1616 | 4040 | 297 | 54 | 1 | 1613 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1616 | 4040 | 297 | 54 | 0 | 3426 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1616 | 4040 | 297 | 54 | 1 | 2699 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1616 | 4040 | 297 | 54 | 1 | 2979 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1616 | 4040 | 297 | 54 | 7 | 26546 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1616 | 4040 | 297 | 54 | 1 | 4040 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1891 | 4031 | 281.7 | 54 | 1 | 3797 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3988 | 297.6 | 54 | 12 | 43869 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1720 | 3952 | 295 | 54 | 2 | 5462 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1720 | 3952 | 295 | 54 | 9 | 30554 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3942 | 297.5 | 54 | 4 | 14550 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3942 | 297.5 | 54 | 2 | 7385 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3939 | 297 | 54 | 7 | 26915 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 3 | 9439 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 15 | 42829 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 5 | 16622 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 1 | 3692 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 2805 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 5 | 14367 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 48 | 132943 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 13 | 41579 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 2 | 5174 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 4 | 14801 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 26 | 94617 |

Waterborne Commerce Statistics Center MS River Transport Data - 2004

| Comm Name | COMMODITY | DIRECTION | ESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 2 | 7728 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 2 | 7386 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 4 | 14771 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 12 | 44440 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3175 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 3 | 10259 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 56 | 205400 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3693 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 16 | 58786 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3353 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1803 | 3804 | 297.5 | 54 | 1 | 3798 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1803 | 3800 | 297 | 54 | 2 | 6060 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1702 | 3796 | 297.6 | 54.1 | 3 | 8911 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 2239 | 3740 | 298 | 54 | 2 | 6185 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1717 | 3725 | 297.6 | 54 | 1 | 2701 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1717 | 3725 | 297.5 | 54 | 2 | 7468 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1724 | 3725 | 297 | 54 | 2 | 6344 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1724 | 3725 | 297.5 | 54 | 2 | 7895 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1717 | 3724 | 297.5 | 54 | 1 | 3380 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1754 | 3700 | 297.5 | 54 | 1 | 3400 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3700 | 297.5 | 54 | 1 | 1294 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3700 | 297.5 | 54 | 0 | 4762 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3700 | 297.5 | 54 | 2 | 7496 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1897 | 3688 | 290 | 54 | 1 | 3797 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2044 | 3688 | 290 | 54 | 1 | 3855 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2045 | 3688 | 290 | 54 | 1 | 3164 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2045 | 3688 | 290 | 54 | 1 | 3855 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1740 | 3674 | 297.6 | 54.1 | 2 | 7563 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3656 | 297.5 | 54 | 1 | 3167 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1660 | 3656 | 297.6 | 54 | 1 | 2674 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 2 | 6085 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 12 | 35576 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 12 | 38312 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 5 | 19176 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1660 | 3656 | 297.6 | 54 | 1 | 1024 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1660 | 3656 | 297.6 | 54 | 1 | 4066 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1660 | 3656 | 297.6 | 54 | 1 | 2730 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1660 | 3656 | 297.6 | 54 | 1 | 3200 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3646 | 297.5 | 54 | 4 | 14983 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3646 | 297.5 | 54 | 2 | 7427 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1574 | 3633 | 297.5 | 52.5 | 2 | 6194 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1574 | 3633 | 297.5 | 52.5 | 1 | 3380 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1574 | 3633 | 297.5 | 52.5 | 15 | 41617 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1618 | 3632 | 297.6 | 54 | 5 | 16340 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 3612 | 300 | 54 | 2 | 6162 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3595 | 297.5 | 54 | 2 | 7588 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1633 | 3583 | 300 | 54 | 1 | 2994 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3580 | 297.5 | 54 | 1 | 3798 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3579 | 297.5 | 54 | 5 | 17891 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3576 | 297.5 | 54 | 2 | 6956 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3567 | 297.5 | 54 | 6 | 21601 |

Waterborne Commerce Statistics Center MS River Transport Data - 2004

| Comm Name | COMMODITY | DIRECTION | ESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1710 | 3525 | 297.5 | 54 | 1 | 3459 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1710 | 3525 | 297.5 | 54 | 2 | 6372 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1721 | 3525 | 297.5 | 54 | 1 | 3693 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1440 | 3523 | 272.5 | 50 | 1 | 2710 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1440 | 3523 | 272.5 | 50 | 2 | 5188 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1706 | 3505 | 297.6 | 54.1 | 1 | 3614 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 816 | 3500 | 150 | 54 | 1 | 1776 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1943 | 3500 | 295 | 54 | 1 | 2124 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1943 | 3500 | 295 | 54 | 2 | 7290 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1762 | 3397 | 252.5 | 50 | 1 | 2814 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1762 | 3397 | 252.5 | 50 | 5 | 12533 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1424 | 3390 | 272.6 | 50 | 2 | 5515 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1424 | 3390 | 272.6 | 50 | 3 | 6340 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1660 | 3373 | 297.5 | 54 | 1 | 1282 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1660 | 3373 | 297.5 | 54 | 0 | 1281 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1660 | 3373 | 297.5 | 54 | 2 | 6250 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1660 | 3373 | 297.5 | 54 | 1 | 3600 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1653 | 3363 | 297.6 | 54.1 | 1 | 3797 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1363 | 3357 | 225 | 54 | 1 | 2616 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1637 | 3350 | 297.5 | 54 | 3 | 9596 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1653 | 3350 | 297.6 | 54 | 0 | 3474 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1882 | 3321 | 297.6 | 54 | 1 | 3910 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1659 | 3317 | 297.5 | 54 | 3 | 9947 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3314 | 297.6 | 54 | 5 | 16391 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1798 | 3300 | 295 | 50 | 1 | 3165 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 2049 | 3300 | 297.5 | 54 | 2 | 5454 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2049 | 3300 | 297.5 | 54 | 6 | 21655 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2049 | 3300 | 297.5 | 54 | 20 | 74573 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1754 | 3283 | 297.5 | 54 | 2 | 6953 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3200 | 297.5 | 54 | 0 | 3488 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 3200 | 297.5 | 54 | 9 | 33031 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1807 | 3200 | 290 | 54 | 1 | 3059 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1810 | 3200 | 295 | 54 | 1 | 3606 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1489 | 3118 | 297.6 | 54.1 | 2 | 7363 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1489 | 3117 | 297.6 | 54.1 | 1 | 3164 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 2014 | 3100 | 290 | 52.5 | 1 | 3079 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1839 | 3100 | 290 | 52.5 | 2 | 7186 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2014 | 3100 | 290 | 52.5 | 6 | 20762 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1543 | 3070 | 264 | 54 | 1 | 1156 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1543 | 3070 | 264 | 54 | 16 | 47373 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1464 | 3000 | 267 | 52.5 | 1 | 2271 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1632 | 3000 | 300 | 54 | 1 | 2595 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1714 | 3000 | 295 | 50 | 1 | 2849 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 2228 | 3000 | 297.5 | 52.5 | 1 | 3128 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1464 | 3000 | 267 | 52.5 | 13 | 36778 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1543 | 3000 | 280 | 54 | 32 | 85420 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2228 | 3000 | 297.5 | 52.5 | 7 | 24334 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1487 | 2964 | 264 | 54 | 1 | 1160 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1555 | 2964 | 264 | 54 | 8 | 23707 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1992 | 2890 | 180 | 54 | 2 | 4809 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1467 | 2882 | 275 | 54 | 8 | 24267 |

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| Comm Name | COMMODITY | DIRECTION | VESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1619 | 2812 | 297.5 | 54 | 1 | 2908 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1619 | 2812 | 297.5 | 54 | 1 | 3060 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 914 | 2800 | 147.5 | 52.5 | 3 | 5872 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2147 | 2700 | 297.5 | 54 | 1 | 3693 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1760 | 2593 | 297.6 | 54.1 | 19 | 68760 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 759 | 2570 | 148.8 | 54.1 | 1 | 10 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1455 | 2500 | 290 | 54 | 1 | 2891 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1038 | 2500 | 155.1 | 54 | 9 | 16944 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1088 | 2300 | 200 | 54 | 1 | 2119 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 2290 | 147.6 | 54 | 2 | 3599 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1144 | 2231 | 175 | 54 | 1 | 2271 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1144 | 2231 | 175 | 54 | 2 | 4599 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1144 | 2231 | 175 | 54 | 4 | 8640 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1144 | 2231 | 175 | 54 | 4 | 9280 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1144 | 2231 | 175 | 54 | 8 | 18739 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1100 | 2210 | 175 | 54 | 7 | 15746 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 2223 | 2200 | 297.5 | 54 | 1 | 3693 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1296 | 2100 | 200.1 | 52.5 | 12 | 28551 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 735 | 2090 | 200 | 35 | 1 | 1393 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1260 | 2050 | 236 | 52.5 | 1 | 561 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1260 | 2050 | 236 | 52.5 | 0 | 1257 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1260 | 2050 | 236 | 52.5 | 1 | 1512 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1260 | 2050 | 236 | 52.5 | 3 | 4820 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1260 | 2050 | 236 | 52.5 | 1 | 1980 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1034 | 1965 | 155 | 54 | 17 | 31008 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1012 | 1939 | 155 | 54 | 4 | 6640 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 1012 | 1939 | 155 | 54 | 10 | 19684 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 1025 | 1800 | 150 | 52.5 | 1 | 1721 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 796 | 1800 | 147.6 | 54 | 1 | 1854 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 896 | 1800 | 147.5 | 54 | 4 | 7135 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 805 | 1762 | 195 | 35 | 1 | 1015 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 805 | 1762 | 195 | 35 | 6 | 7604 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 806 | 1740 | 200 | 35 | 1 | 1325 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 860 | 1740 | 195 | 35 | 1 | 656 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 860 | 1740 | 195 | 35 | 2 | 1951 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 860 | 1740 | 195 | 35 | 3 | 3844 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 860 | 1740 | 195 | 35 | 2 | 2638 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1700 | 147.6 | 54 | 4 | 5382 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1700 | 147.6 | 54 | 2 | 3067 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 894 | 1660 | 195 | 35 | 1 | 1082 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 894 | 1660 | 195 | 35 | 2 | 2628 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 894 | 1660 | 195 | 35 | 4 | 5160 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 816 | 1622 | 195 | 54 | 1 | 1945 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1577 | 500 | 35 | 1 | 831 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1577 | 500 | 35 | 2 | 2622 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1577 | 500 | 35 | 5 | 6526 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 698 | 1539 | 147.2 | 50 | 4 | 6812 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 550 | 1500 | 135.1 | 50.1 | 1 | 1438 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 730 | 1500 | 138 | 52.5 | 2 | 3709 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 735 | 1500 | 200 | 35 | 1 | 1423 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 735 | 1500 | 200 | 35 | 1 | 1431 |

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| Comm Name | COMMODITY | DIRECTION | ESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Dist. Fuel Oil | 33419 | Upbound | 5 | 730 | 1500 | 138 | 52.5 | 6 | 9478 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 806 | 1469 | 200 | 35 | 1 | 1412 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1469 | 200 | 35 | 1 | 656 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1469 | 200 | 35 | 2 | 1953 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1469 | 200 | 35 | 1 | 1239 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1469 | 200 | 35 | 4 | 5340 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 795 | 1465 | 195 | 35 | 2 | 1705 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 795 | 1465 | 195 | 35 | 2 | 2479 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 795 | 1465 | 195 | 35 | 5 | 6417 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 795 | 1465 | 195 | 35 | 1 | 1340 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 800 | 1465 | 195 | 35 | 1 | 999 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 800 | 1465 | 195 | 35 | 1 | 1251 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 800 | 1465 | 195 | 35 | 4 | 5239 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 683 | 1457 | 131 | 50 | 1 | 1282 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 683 | 1457 | 131 | 50 | 1 | 1388 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 850 | 1450 | 131 | 50 | 1 | 1454 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 735 | 1400 | 200 | 35 | 1 | 1396 |
| Dist. Fuel Oil | 33419 | Downbound | 5 | 796 | 1400 | 130 | 54 | 1 | 1177 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 796 | 1400 | 130 | 54 | 1 | 992 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 796 | 1400 | 130 | 54 | 4 | 4975 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 796 | 1400 | 130 | 54 | 2 | 2801 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1360 | 200 | 35 | 5 | 6657 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 806 | 1360 | 200 | 35 | 2 | 2824 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 725 | 1242 | 99.4 | 54 | 4 | 5159 |
| Dist. Fuel Oil | 33419 | Upbound | 5 | 415 | 1080 | 150.4 | 36 | 1 | 1286 |
| | | | | | | | "Zero" TRIPS | 100 | |
| | | | | | | Sum all TRIPS and TONS | | 1088 | 2952750 |
| | | | | | | | | TONS/TRIP | 2714 |
| Napth & Solv | 33429 | Upbound | 5 | 2082 | 5386 | 297.5 | 54 | 1 | 4366 |
| Napth & Solv | 33429 | Upbound | 5 | 1616 | 4802 | 297 | 54 | 1 | 3523 |
| Napth & Solv | 33429 | Downbound | 5 | 1732 | 4528 | 295 | 54 | 1 | 4118 |
| Napth & Solv | 33429 | Downbound | 5 | 2500 | 4500 | 0 | 0 | 1 | 3617 |
| Napth & Solv | 33429 | Upbound | 5 | 1961 | 4482 | 297.5 | 54 | 1 | 3408 |
| Napth & Solv | 33429 | Upbound | 5 | 1958 | 4420 | 297 | 52.6 | 1 | 4531 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 3376 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 4351 | 297.5 | 54 | 1 | 3441 |
| Napth & Solv | 33429 | Upbound | 5 | 1754 | 4338 | 297.5 | 54 | 1 | 3000 |
| Napth & Solv | 33429 | Upbound | 5 | 1754 | 4338 | 297.5 | 54 | 3 | 9000 |
| Napth & Solv | 33429 | Upbound | 5 | 1754 | 4338 | 297.5 | 54 | 1 | 3000 |
| Napth & Solv | 33429 | Upbound | 5 | 1892 | 4305 | 297.5 | 54 | 2 | 6203 |
| Napth & Solv | 33429 | Downbound | 5 | 2264 | 4289 | 297 | 54 | 1 | 3238 |
| Napth & Solv | 33429 | Upbound | 5 | 2264 | 4289 | 297 | 54 | 3 | 12360 |
| Napth & Solv | 33429 | Upbound | 5 | 2264 | 4289 | 297 | 54 | 2 | 8642 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 4267 | 297.5 | 54 | 1 | 3949 |
| Napth & Solv | 33429 | Upbound | 5 | 2016 | 4260 | 297.5 | 54 | 1 | 404 |
| Napth & Solv | 33429 | Upbound | 5 | 2016 | 4260 | 297.5 | 54 | 1 | 1248 |
| Napth & Solv | 33429 | Upbound | 5 | 2016 | 4260 | 297.5 | 54 | 1 | 1800 |
| Napth & Solv | 33429 | Upbound | 5 | 2016 | 4260 | 297.5 | 54 | 0 | 8454 |
| Napth & Solv | 33429 | Upbound | 5 | 2016 | 4260 | 297.5 | 54 | 0 | 2057 |
| Napth & Solv | 33429 | Upbound | 5 | 2026 | 4260 | 297.5 | 54 | 1 | 807 |

Waterborne Commerce Statistics Center MS River Transport Data - 2004

| Comm Name | COMMODITY | DIRECTION | VESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Napth & Solv | 33429 | Upbound | 5 | 2026 | 4260 | 297.5 | 54 | 0 | 8506 |
| Napth & Solv | 33429 | Upbound | 5 | 2026 | 4260 | 297.5 | 54 | 0 | 421 |
| Napth & Solv | 33429 | Upbound | 5 | 2026 | 4260 | 297.5 | 54 | 2 | 3333 |
| Napth & Solv | 33429 | Upbound | 5 | 2026 | 4260 | 297.5 | 54 | 1 | 2826 |
| Napth & Solv | 33429 | Upbound | 5 | 1894 | 4234 | 297.5 | 54 | 1 | 3680 |
| Napth & Solv | 33429 | Downbound | 5 | 1400 | 4196 | 297 | 54 | 1 | 4118 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 4196 | 297.5 | 54 | 1 | 3364 |
| Napth & Solv | 33429 | Upbound | 5 | 2012 | 4180 | 300 | 54 | 1 | 3500 |
| Napth & Solv | 33429 | Upbound | 5 | 1897 | 4059 | 297.5 | 54 | 1 | 4247 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 4054 | 297.5 | 54 | 2 | 8642 |
| Napth & Solv | 33429 | Upbound | 5 | 1993 | 3998 | 297.6 | 54 | 1 | 327 |
| Napth & Solv | 33429 | Upbound | 5 | 1993 | 3998 | 297.6 | 54 | 1 | 897 |
| Napth & Solv | 33429 | Upbound | 5 | 1993 | 3998 | 297.6 | 54 | 0 | 1054 |
| Napth & Solv | 33429 | Upbound | 5 | 1993 | 3998 | 297.6 | 54 | 1 | 1583 |
| Napth & Solv | 33429 | Upbound | 5 | 1993 | 3998 | 297.6 | 54 | 1 | 10472 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 3942 | 297.5 | 54 | 1 | 3407 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3942 | 297.5 | 54 | 1 | 3408 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 1 | 3215 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 7 | 20106 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 2 | 6075 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 3891 | 297 | 54 | 1 | 3407 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 2 | 4057 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3083 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3010 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 33 | 95392 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 9 | 28292 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 1874 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 2 | 6271 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 13 | 45733 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 2 | 6816 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 2 | 6514 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3089 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 43 | 141022 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 7 | 22425 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3407 |
| Napth & Solv | 33429 | Downbound | 5 | 1702 | 3796 | 297.6 | 54.1 | 1 | 2679 |
| Napth & Solv | 33429 | Upbound | 5 | 1702 | 3796 | 297.6 | 54.1 | 3 | 12151 |
| Napth & Solv | 33429 | Upbound | 5 | 1717 | 3725 | 297.5 | 54 | 3 | 13325 |
| Napth & Solv | 33429 | Upbound | 5 | 1717 | 3725 | 297.6 | 54 | 1 | 3199 |
| Napth & Solv | 33429 | Upbound | 5 | 1724 | 3725 | 297 | 54 | 1 | 3954 |
| Napth & Solv | 33429 | Upbound | 5 | 1717 | 3724 | 297.5 | 54 | 1 | 3978 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3700 | 297.5 | 54 | 1 | 3523 |
| Napth & Solv | 33429 | Upbound | 5 | 2044 | 3688 | 290 | 54 | 1 | 3413 |
| Napth & Solv | 33429 | Upbound | 5 | 2045 | 3688 | 290 | 54 | 1 | 3413 |
| Napth & Solv | 33429 | Downbound | 5 | 844 | 3663 | 155 | 54 | 1 | 2543 |
| Napth & Solv | 33429 | Upbound | 5 | 844 | 3663 | 155 | 54 | 1 | 2859 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3662 | 297.5 | 54 | 1 | 4531 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 3656 | 297.5 | 54 | 2 | 6426 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 1 | 2835 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 3 | 9765 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 1 | 3835 |

Waterborne Commerce Statistics Center MS River Transport Data - 2004

| Comm Name | COMMODITY | DIRECTION | VESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Napth & Solv | 33429 | Upbound | 5 | 1660 | 3656 | 297.6 | 54 | 1 | 2394 |
| Napth & Solv | 33429 | Upbound | 5 | 1660 | 3656 | 297.6 | 54 | 1 | 2835 |
| Napth & Solv | 33429 | Upbound | 5 | 1660 | 3656 | 297.6 | 54 | 1 | 3200 |
| Napth & Solv | 33429 | Upbound | 5 | 1574 | 3633 | 297.5 | 52.5 | 3 | 11665 |
| Napth & Solv | 33429 | Downbound | 5 | 1618 | 3632 | 297.6 | 54 | 1 | 4158 |
| Napth & Solv | 33429 | Upbound | 5 | 1618 | 3632 | 297.6 | 54 | 1 | 4464 |
| Napth & Solv | 33429 | Upbound | 5 | 1754 | 3595 | 297.5 | 54 | 1 | 3164 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3595 | 297.5 | 54 | 2 | 7851 |
| Napth & Solv | 33429 | Downbound | 5 | 1943 | 3500 | 295 | 54 | 2 | 4523 |
| Napth & Solv | 33429 | Downbound | 5 | 1660 | 3373 | 297.5 | 54 | 1 | 3000 |
| Napth & Solv | 33429 | Downbound | 5 | 1637 | 3350 | 297.5 | 54 | 1 | 4118 |
| Napth & Solv | 33429 | Upbound | 5 | 1659 | 3317 | 297.5 | 54 | 1 | 3949 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 3314 | 297.5 | 54 | 1 | 4116 |
| Napth & Solv | 33429 | Upbound | 5 | 1958 | 3300 | 297.6 | 52.6 | 1 | 4235 |
| Napth & Solv | 33429 | Upbound | 5 | 2082 | 3300 | 297.5 | 54 | 1 | 4367 |
| Napth & Solv | 33429 | Downbound | 5 | 1810 | 3200 | 295 | 54 | 1 | 4118 |
| Napth & Solv | 33429 | Upbound | 5 | 1810 | 3200 | 295 | 54 | 1 | 3954 |
| Napth & Solv | 33429 | Upbound | 5 | 2014 | 3100 | 290 | 52.5 | 1 | 3295 |
| Napth & Solv | 33429 | Upbound | 5 | 2228 | 3000 | 297.5 | 52.5 | 2 | 6492 |
| Napth & Solv | 33429 | Downbound | 5 | 1619 | 2812 | 297.5 | 54 | 1 | 2750 |
| Napth & Solv | 33429 | Upbound | 5 | 1619 | 2812 | 297.5 | 54 | 4 | 12531 |
| Napth & Solv | 33429 | Upbound | 5 | 2147 | 2700 | 297.5 | 54 | 1 | 3408 |
| Napth & Solv | 33429 | Upbound | 5 | 1088 | 2400 | 200 | 54 | 1 | 2187 |
| Napth & Solv | 33429 | Upbound | 5 | 1236 | 2370 | 259.7 | 52.5 | 1 | 1512 |
| Napth & Solv | 33429 | Downbound | 5 | 2223 | 2200 | 297.5 | 54 | 1 | 3407 |
| Napth & Solv | 33429 | Upbound | 5 | 2223 | 2200 | 297.5 | 54 | 0 | 1713 |
| Napth & Solv | 33429 | Upbound | 5 | 2223 | 2200 | 297.5 | 54 | 1 | 1713 |
| Napth & Solv | 33429 | Upbound | 5 | 2223 | 2200 | 297.5 | 54 | 1 | 2795 |
| Napth & Solv | 33429 | Upbound | 5 | 446 | 2048 | 195 | 35 | 1 | 1400 |
| Napth & Solv | 33429 | Upbound | 5 | 802 | 1943 | 147.5 | 54 | 4 | 5924 |
| Napth & Solv | 33429 | Upbound | 5 | 769 | 1870 | 195.1 | 35 | 1 | 1147 |
| Napth & Solv | 33429 | Upbound | 5 | 880 | 1823 | 147.5 | 54 | 5 | 4975 |
| Napth & Solv | 33429 | Upbound | 5 | 907 | 1739 | 206 | 38 | 1 | 1401 |
| Napth & Solv | 33429 | Downbound | 5 | 983 | 1700 | 155 | 54 | 1 | 2543 |
| Napth & Solv | 33429 | Upbound | 5 | 500 | 1695 | 200 | 35 | 1 | 1350 |
| Napth & Solv | 33429 | Upbound | 5 | 698 | 1688 | 195 | 35 | 1 | 1178 |
| Napth & Solv | 33429 | Upbound | 5 | 716 | 1680 | 195 | 35 | 3 | 4361 |
| Napth & Solv | 33429 | Upbound | 5 | 791 | 1663 | 195 | 35 | 1 | 1449 |
| Napth & Solv | 33429 | Upbound | 5 | 809 | 1660 | 195 | 35 | 1 | 8 |
| Napth & Solv | 33429 | Upbound | 5 | 809 | 1660 | 195 | 35 | 1 | 1149 |
| Napth & Solv | 33429 | Upbound | 5 | 886 | 1586 | 200 | 35 | 1 | 12 |
| Napth & Solv | 33429 | Upbound | 5 | 886 | 1586 | 200 | 35 | 2 | 2366 |
| Napth & Solv | 33429 | Upbound | 5 | 716 | 1559 | 195 | 35 | 1 | 1173 |
| Napth & Solv | 33429 | Upbound | 5 | 705 | 1505 | 200 | 35 | 1 | 1360 |
| Napth & Solv | 33429 | Downbound | 5 | 735 | 1500 | 200 | 35 | 1 | 1369 |
| Napth & Solv | 33429 | Upbound | 5 | 735 | 1500 | 200 | 35 | 1 | 1163 |
| Napth & Solv | 33429 | Upbound | 5 | 735 | 1500 | 200 | 35 | 1 | 1423 |
| Napth & Solv | 33429 | Upbound | 5 | 774 | 1500 | 195 | 35 | 2 | 2934 |
| Napth & Solv | 33429 | Upbound | 5 | 774 | 1500 | 195 | 35 | 1 | 1340 |
| Napth & Solv | 33429 | Upbound | 5 | 822 | 1500 | 200 | 35 | 1 | 1595 |
| Napth & Solv | 33429 | Upbound | 5 | 766 | 1485 | 195 | 35 | 2 | 2829 |

Waterborne Commerce Statistics Center MS River Transport Data - 2004

| Comm Name | COMMODITY | DIRECTION | VESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Napth & Solv | 33429 | Upbound | 5 | 914 | 1480 | 195 | 35 | 1 | 1431 |
| Napth & Solv | 33429 | Upbound | 5 | 798 | 1477 | 195 | 35 | 1 | 1415 |
| Napth & Solv | 33429 | Upbound | 5 | 683 | 1457 | 131 | 50 | 1 | 1301 |
| Napth & Solv | 33429 | Upbound | 5 | 683 | 1457 | 131 | 50 | 1 | 1407 |
| Napth & Solv | 33429 | Upbound | 5 | 716 | 1431 | 195 | 35 | 1 | 1499 |
| Napth & Solv | 33429 | Upbound | 5 | 716 | 1431 | 195 | 35 | 2 | 2622 |
| Napth & Solv | 33429 | Upbound | 5 | 835 | 1426 | 195 | 35 | 1 | 1153 |
| Napth & Solv | 33429 | Upbound | 5 | 735 | 1400 | 200 | 35 | 5 | 7037 |
| Napth & Solv | 33429 | Upbound | 5 | 761 | 1400 | 195 | 35 | 1 | 1301 |
| Napth & Solv | 33429 | Upbound | 5 | 766 | 1400 | 195 | 35 | 1 | 1364 |
| Napth & Solv | 33429 | Upbound | 5 | 766 | 1400 | 195 | 35 | 5 | 7098 |
| Napth & Solv | 33429 | Upbound | 5 | 774 | 1400 | 195.1 | 35.1 | 1 | 1188 |
| Napth & Solv | 33429 | Upbound | 5 | 796 | 1400 | 130 | 54 | 1 | 1054 |
| Napth & Solv | 33429 | Upbound | 5 | 808 | 1400 | 195 | 35 | 1 | 1269 |
| Napth & Solv | 33429 | Upbound | 5 | 1622 | 1346 | 195 | 35 | 1 | 1450 |
| Napth & Solv | 33429 | Upbound | 5 | 716 | 1341 | 195 | 35 | 1 | 1430 |
| Napth & Solv | 33429 | Upbound | 5 | 774 | 1329 | 195 | 35 | 1 | 1480 |
| | | | | | | "Zero" TRIPS | | 25 | |
| | | | | | | Sum all TRIPS and TONS | | 315 | 842406 |
| | | | | | | | | TONS/TRIP | 2674 |
| LNG | 34000 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 3 | 7726 |
| LNG | 34000 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 2 | 5710 |
| LNG | 34000 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3091 |
| LNG | 34000 | Upbound | 5 | 1717 | 3724 | 297.5 | 54 | 1 | 3157 |
| LNG | 34000 | Upbound | 5 | 844 | 3663 | 155 | 54 | 1 | 1319 |
| LNG | 34000 | Downbound | 5 | 2812 | 2474 | 355 | 53 | 1 | 2497 |
| LNG | 34000 | Downbound | 5 | 2812 | 2474 | 355 | 53 | 2 | 4989 |
| LNG | 34000 | Downbound | 5 | 2435 | 2404 | 320 | 53.6 | 3 | 7248 |
| LNG | 34000 | Downbound | 5 | 2435 | 2404 | 320 | 53.6 | 1 | 2412 |
| LNG | 34000 | Upbound | 5 | 1152 | 1800 | 147.8 | 54 | 2 | 3894 |
| LNG | 34000 | Upbound | 5 | 2167 | 1474 | 256 | 53 | 1 | 1224 |
| LNG | 34000 | Upbound | 5 | 2167 | 1474 | 256 | 53 | 5 | 6403 |
| LNG | 34000 | Upbound | 5 | 1022 | 1230 | 218 | 42 | 6 | 6297 |
| LNG | 34000 | Upbound | 5 | 1236 | 1200 | 260 | 42 | 1 | 1238 |
| LNG | 34000 | Upbound | 5 | 1068 | 1021 | 175.1 | 42.1 | 23 | 19706 |
| LNG | 34000 | Upbound | 5 | 1251 | 1012 | 210.1 | 44.1 | 3 | 4783 |
| LNG | 34000 | Upbound | 5 | 1171 | 950 | 210.1 | 44.1 | 1 | 736 |
| LNG | 34000 | Upbound | 5 | 1007 | 900 | 210.1 | 44.1 | 4 | 4472 |
| LNG | 34000 | Upbound | 5 | 1171 | 900 | 210 | 44 | 1 | 759 |
| LNG | 34000 | Upbound | 5 | 928 | 800 | 195.1 | 44.1 | 1 | 1366 |
| | | | | | | "Zero" TRIPS | | 8 | |
| | | | | | | Sum all TRIPS and TONS | | 71 | 89027 |
| | | | | | | | | TONS/TRIP | 1254 |
| Acylic Hydr. | 51119 | Upbound | 5 | 2016 | 4260 | 297.5 | 54 | 0 | 1744 |
| Acylic Hydr. | 51119 | Upbound | 5 | 2026 | 4260 | 297.5 | 54 | 1 | 695 |
| Acylic Hydr. | 51119 | Upbound | 5 | 2026 | 4260 | 297.5 | 54 | 0 | 1056 |
| Acylic Hydr. | 51119 | Upbound | 5 | 1993 | 3998 | 297.6 | 54 | 0 | 3118 |
| Acylic Hydr. | 51119 | Upbound | 5 | 1993 | 3998 | 297.6 | 54 | 0 | 5512 |
| Acylic Hydr. | 51119 | Upbound | 5 | 880 | 1823 | 147.5 | 54 | 1 | 794 |

Waterborne Commerce Statistics Center — MS River Transport Data - 2004

| Comm Name | COMMODITY | DIRECTION | VESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | "Zero" TRIPS | | 7 | |
| | | | | | | Sum all TRIPS and TONS | | 9 | 12919 |
| | | | | | | | | TONS/TRIP | 1435 |
| Benzene | 51122 | Upbound | 5 | 1679 | 3500 | 297.6 | 54 | 1 | 3841 |
| Benzene | 51122 | Upbound | 5 | 1803 | 3082 | 297 | 54 | 1 | 3577 |
| Benzene | 51122 | Downbound | 5 | 1061 | 2200 | 195 | 54 | 3 | 6710 |
| Benzene | 51122 | Downbound | 5 | 809 | 1760 | 195 | 35 | 1 | 1448 |
| Benzene | 51122 | Upbound | 5 | 747 | 1750 | 200 | 35 | 4 | 7000 |
| Benzene | 51122 | Downbound | 5 | 698 | 1688 | 195 | 35 | 1 | 1542 |
| Benzene | 51122 | Upbound | 5 | 698 | 1688 | 195 | 35 | 1 | 1432 |
| Benzene | 51122 | Downbound | 5 | 886 | 1586 | 200 | 35 | 1 | 1450 |
| Benzene | 51122 | Downbound | 5 | 735 | 1500 | 200 | 35 | 3 | 4359 |
| Benzene | 51122 | Upbound | 5 | 698 | 1466 | 195 | 35 | 1 | 1491 |
| Benzene | 51122 | Downbound | 5 | 716 | 1464 | 195 | 35 | 1 | 1514 |
| Benzene | 51122 | Downbound | 5 | 716 | 1431 | 195 | 35 | 1 | 1413 |
| Benzene | 51122 | Downbound | 5 | 773 | 1423 | 195.1 | 35.1 | 2 | 3057 |
| Benzene | 51122 | Downbound | 5 | 735 | 1400 | 200 | 35 | 3 | 4196 |
| Benzene | 51122 | Downbound | 5 | 774 | 1400 | 195 | 35 | 1 | 1200 |
| Benzene | 51122 | Downbound | 5 | 774 | 1400 | 195.1 | 35.1 | 1 | 1524 |
| Benzene | 51122 | Downbound | 5 | 808 | 1400 | 195 | 35 | 2 | 2813 |
| Benzene | 51122 | Upbound | 5 | 774 | 1400 | 195.1 | 35.1 | 1 | 1491 |
| Benzene | 51122 | Downbound | 5 | 914 | 1350 | 195 | 35 | 2 | 2997 |
| | | | | | | "Zero" TRIPS | | 0 | |
| | | | | | | Sum all TRIPS and TONS | | 31 | 53055 |
| | | | | | | | | TONS/TRIP | 1711 |
| Toluene | 51123 | Downbound | 5 | 1627 | 4596 | 299 | 54 | 1 | 2781 |
| Toluene | 51123 | Upbound | 5 | 2016 | 4260 | 297.5 | 54 | 1 | 388 |
| Toluene | 51123 | Upbound | 5 | 1993 | 3998 | 297.6 | 54 | 1 | 1524 |
| Toluene | 51123 | Upbound | 5 | 1619 | 3988 | 297.6 | 54 | 2 | 3666 |
| Toluene | 51123 | Upbound | 5 | 1619 | 3891 | 297 | 54 | 2 | 2769 |
| Toluene | 51123 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 7 | 17965 |
| Toluene | 51123 | Upbound | 5 | 1619 | 3891 | 297.5 | 54 | 1 | 3045 |
| Toluene | 51123 | Downbound | 5 | 1619 | 3750 | 297.6 | 54 | 1 | 2782 |
| Toluene | 51123 | Upbound | 5 | 1717 | 3725 | 297.6 | 54 | 1 | 2336 |
| Toluene | 51123 | Upbound | 5 | 1619 | 3656 | 297.5 | 54 | 1 | 2520 |
| Toluene | 51123 | Upbound | 5 | 1710 | 3571 | 297.5 | 54 | 1 | 2336 |
| Toluene | 51123 | Upbound | 5 | 1710 | 3525 | 297.6 | 54 | 1 | 2749 |
| Toluene | 51123 | Upbound | 5 | 1440 | 3523 | 272.5 | 50 | 1 | 3165 |
| Toluene | 51123 | Upbound | 5 | 1943 | 3500 | 295 | 54 | 1 | 3040 |
| Toluene | 51123 | Upbound | 5 | 1424 | 3397 | 272.5 | 50 | 1 | 3165 |
| Toluene | 51123 | Upbound | 5 | 1992 | 2890 | 180 | 54 | 1 | 2222 |
| Toluene | 51123 | Upbound | 5 | 1177 | 2460 | 175.1 | 50 | 1 | 1959 |
| Toluene | 51123 | Downbound | 5 | 1236 | 2370 | 259.7 | 52.5 | 1 | 1540 |
| Toluene | 51123 | Upbound | 5 | 1061 | 2281 | 195.1 | 54 | 1 | 1661 |
| Toluene | 51123 | Upbound | 5 | 1622 | 2222 | 195 | 35 | 1 | 1431 |
| Toluene | 51123 | Upbound | 5 | 983 | 1700 | 155 | 54 | 1 | 1385 |
| Toluene | 51123 | Upbound | 5 | 716 | 1680 | 195 | 35 | 1 | 1450 |
| Toluene | 51123 | Downbound | 5 | 791 | 1663 | 195 | 35 | 1 | 1431 |
| Toluene | 51123 | Downbound | 5 | 822 | 1500 | 200 | 35 | 2 | 2981 |

Waterborne Commerce Statistics Center MS River Transport Data - 2004

| Comm Name | COMMODITY | DIRECTION | ESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Toluene | 51123 | Upbound | 5 | 735 | 1500 | 200 | 35 | 1 | 1518 |
| Toluene | 51123 | Downbound | 5 | 716 | 1431 | 195 | 35 | 1 | 1434 |
| Toluene | 51123 | Downbound | 5 | 716 | 1431 | 195 | 35 | 1 | 1420 |
| Toluene | 51123 | Downbound | 5 | 766 | 1400 | 195 | 35 | 1 | 1413 |
| Toluene | 51123 | Downbound | 5 | 773 | 1350 | 195 | 35 | 1 | 1432 |
| Toluene | 51123 | Upbound | 5 | 773 | 1350 | 195 | 35 | 1 | 1586 |
| Toluene | 51123 | Downbound | 5 | 772 | 1348 | 195 | 35 | 1 | 1471 |
| Toluene | 51123 | Downbound | 5 | 716 | 1341 | 195 | 35 | 1 | 1424 |
| | | | | | | | "Zero" TRIPS | 0 | |
| | | | | | | Sum all TRIPS and TONS | | 41 | 81989 |
| | | | | | | | | TONS/TRIP | 2000 |
| Ammonia | 52261 | Downbound | 5 | 2502 | 2902 | 295 | 50 | 1 | 2375 |
| Ammonia | 52261 | Upbound | 5 | 2502 | 2902 | 295 | 50 | 6 | 16063 |
| Ammonia | 52261 | Upbound | 5 | 3084 | 2874 | 298 | 54 | 20 | 50000 |
| Ammonia | 52261 | Upbound | 5 | 3084 | 2874 | 298 | 54 | 12 | 30000 |
| Ammonia | 52261 | Upbound | 5 | 2688 | 2800 | 298 | 54 | 9 | 22500 |
| Ammonia | 52261 | Upbound | 5 | 2688 | 2800 | 298 | 54 | 7 | 17500 |
| Ammonia | 52261 | Upbound | 5 | 2840 | 2800 | 298 | 54 | 20 | 50000 |
| Ammonia | 52261 | Upbound | 5 | 2840 | 2800 | 298 | 54 | 12 | 30000 |
| Ammonia | 52261 | Downbound | 5 | 2200 | 2720 | 270 | 53 | 1 | 2500 |
| Ammonia | 52261 | Downbound | 5 | 2328 | 2720 | 298 | 53 | 2 | 5000 |
| Ammonia | 52261 | Upbound | 5 | 2200 | 2720 | 270 | 53 | 6 | 15000 |
| Ammonia | 52261 | Upbound | 5 | 2200 | 2720 | 270 | 53 | 8 | 20000 |
| Ammonia | 52261 | Upbound | 5 | 2328 | 2720 | 298 | 53 | 13 | 32500 |
| Ammonia | 52261 | Upbound | 5 | 2424 | 2642 | 295 | 50 | 7 | 17586 |
| Ammonia | 52261 | Upbound | 5 | 2688 | 2600 | 298 | 54 | 9 | 22500 |
| Ammonia | 52261 | Upbound | 5 | 2688 | 2600 | 298 | 54 | 7 | 17500 |
| Ammonia | 52261 | Downbound | 5 | 1803 | 2500 | 295 | 52 | 1 | 2500 |
| Ammonia | 52261 | Downbound | 5 | 2356 | 2500 | 270 | 50 | 1 | 2500 |
| Ammonia | 52261 | Downbound | 5 | 2380 | 2500 | 300 | 50 | 1 | 2500 |
| Ammonia | 52261 | Downbound | 5 | 2435 | 2500 | 294 | 50 | 1 | 2452 |
| Ammonia | 52261 | Upbound | 5 | 1803 | 2500 | 295 | 52 | 17 | 42500 |
| Ammonia | 52261 | Upbound | 5 | 2356 | 2500 | 270 | 50 | 8 | 20000 |
| Ammonia | 52261 | Upbound | 5 | 2380 | 2500 | 300 | 50 | 1 | 2500 |
| Ammonia | 52261 | Upbound | 5 | 2380 | 2500 | 300 | 50 | 28 | 70000 |
| Ammonia | 52261 | Upbound | 5 | 2431 | 2500 | 280 | 50 | 10 | 25000 |
| Ammonia | 52261 | Upbound | 5 | 2435 | 2500 | 294 | 50 | 1 | 2454 |
| Ammonia | 52261 | Upbound | 5 | 2482 | 2500 | 293 | 50 | 4 | 10000 |
| Ammonia | 52261 | Upbound | 5 | 2482 | 2500 | 293 | 50 | 20 | 50000 |
| Ammonia | 52261 | Upbound | 5 | 2700 | 2500 | 281 | 50 | 12 | 30000 |
| Ammonia | 52261 | Upbound | 5 | 2891 | 2350 | 282 | 52.5 | 1 | 2500 |
| Ammonia | 52261 | Upbound | 5 | 2917 | 2350 | 295 | 52.5 | 19 | 47500 |
| Ammonia | 52261 | Downbound | 5 | 2424 | 2213 | 295 | 50 | 3 | 7510 |
| Ammonia | 52261 | Upbound | 5 | 2424 | 2213 | 295 | 50 | 8 | 20075 |
| Ammonia | 52261 | Upbound | 5 | 2424 | 2212 | 295 | 50 | 7 | 17620 |
| Ammonia | 52261 | Upbound | 5 | 2482 | 2208 | 294 | 50 | 5 | 12542 |
| Ammonia | 52261 | Downbound | 5 | 2482 | 2203 | 294 | 50 | 1 | 2486 |
| Ammonia | 52261 | Upbound | 5 | 2482 | 2203 | 294 | 50 | 5 | 12517 |
| Ammonia | 52261 | Downbound | 5 | 2482 | 2202 | 293 | 50 | 3 | 7477 |
| Ammonia | 52261 | Upbound | 5 | 2482 | 2202 | 293 | 50 | 8 | 19962 |

Waterborne Commerce Statistics Center MS River Transport Data - 2004

| Comm Name | COMMODITY | DIRECTION | VESSEL_TYP | NRT | CAP_TONS | LENGTH | BREADTH | TRIPS | TONS |
|---|---|---|---|---|---|---|---|---|---|
| Ammonia | 52261 | Upbound | 5 | 2356 | 2200 | 293 | 50 | 3 | 7433 |
| Ammonia | 52261 | Upbound | 5 | 2491 | 2100 | 283 | 50 | 2 | 4818 |
| Ammonia | 52261 | Downbound | 5 | 2481 | 2098 | 283 | 50 | 1 | 2702 |
| Ammonia | 52261 | Upbound | 5 | 2481 | 2098 | 283 | 50 | 2 | 4758 |
| Ammonia | 52261 | Upbound | 5 | 2499 | 2098 | 269 | 52.7 | 2 | 4622 |
| | | | | | | | "Zero" TRIPS | 2 | |
| | | | | | | | Sum all TRIPS and TONS | 317 | 787952 |
| | | | | | | | | TONS/TRIP | 2486 |

ZERO TRIP Data from USACE WCSC Database for Commodities of Interest

**2004 Zero Trips**

| COMMODITY | COUNT |
|---|---|
| 33411 | 90 |
| 33419 | 100 |
| 33429 | 25 |
| 34000 | 8 |
| 51119 | 7 |
| 52261 | 2 |

**2003 Zero Trips**

| COMMODITY | COUNT |
|---|---|
| 33411 | 74 |
| 33419 | 69 |
| 33429 | 24 |
| 34000 | 11 |
| 51119 | 9 |
| 52261 | 1 |

**ENERCON SERVICE, INC.**
**12850 Middlebrook Rd., Suite 304**
**Germantown, MD 20874**
**(301) 972-5221**
**(301) 972-5393 (Fax)**

**MEMO TO FILE**

FROM: Guy Cesare
SUBJECT: WCSC Request #6328, Clarifications and Understandings
PROJECT: Grand Gulf ESP, Barge Hazard RAI
DATE: 2/13/2006

Purpose

Mr. Jim Lambert (US Army Corps of Engrs, Waterborne Commerce Statistics Center) provided the subject report for requested commodities via email on 2/2/2006. Enercon had requested Pass the Point (PTP) reports from WCSC for a collection of commodities in the WCSC database for 2003 and 2004. Subsequently on 2/6, Enercon requested that PTP reports also be provided for two additional commodities (crude petroleum and acyclic hydrocarbons). Mr. Lambert provided an updated data report with the additional commodities on 2/7.

This memo documents a conference call (2/6/2006 with Jim Lambert, including Al Schneider, Rachel Turney, and Guy Cesare) and a series of email exchanges. These communications were to obtain clarifications and better understanding of the data provided in the subject report.

Understandings Reached

The following understandings and clarifications were reached: (For purposes here, "vessel" and "barge" are interchangeable terms.)

1. Data in a given row of this report provides information on the specific commodity, passing mile marker 406 (approx. site of plant), using the specific type of barge listed. For confidentiality purposes, reported data is aggregated. Thus, a given row likely contains the combined tonnage of multiple records.

2. CAP_TONS. This value is the reported vessel (i.e., barge) capacity in short tons. In a given single shipment, there may have been multiple barges of this particular type barge. For a given commodity, the largest value of

CAP_TONS would reflect the largest capacity for a barge carrying that commodity past the site during that year.

3. TONS. This value reflects the total tonnage of the subject commodity for that row shipped past the point. If multiple barges were involved, this value reflects the total cargo. As noted above, because this data is an aggregated value, this is the sum of all cargoes carried for the trip reports included in that row.

4. TRIPS. In general, a "trip," as used and recorded in the vessel operator's report, is a barge movement. To accomplish the specific goals of the WCSC database, the TRIP value in this report reflects a specialized data entry convention used by WCSC.
   a. For this reason, the TRIP value in a single row does not necessarily reflect the total number of trips past the point. Rather, the TRIP value listed in the Pass the Point report slightly undercounts the total number of trips past the point.
   b. In addition, for this reason, some rows show a TRIP value of zero. This is an outcome in a Pass the Point report related to how the data is entered in the WCSC database. The TONS value listed, however, is a sum of all cargo (of that commodity) shipped past the point from all vessel reports related to that particular row.
   c. For a given commodity, Mr. Lambert subsequently provided the number of "zero" trips, which when added to the total trips in the database provides an accurate measure of actual total trips past the point.
   d. "Zero" Trips. One of the purposes of this WCSC database is to provide an accurate accounting of cargo movements so that each port where cargo is handled, loaded, or unloaded can be given appropriate credit in the WCSC summary reports. Some rows (in the PTP report) indicate a zero value in the TRIPS data field. In general, the ZERO entry in a PTP report is an artifact of the accounting scheme, as explained below and is generally only encountered in a PTP report which is a special use of the database.
      (1) The PTP report is a capability of the WCSC database but is not a routinely generated query. This PTP was generated based on Enercon's special request and a particular interest in knowing about what cargo passed a certain location (but was not loaded or unloaded). While individual rows in the requested PTP reports show TRIPS data, this "raw" data is typically not needed or provided in WCSC published reports. (The WCSC published reports provide overall roll-up information on total trips and would not be suitable for Enercon's specific purpose.)
      (2) A zero entry is a convention used by WCSC to properly record cargo movements that involve partial cargo loading or unloading. A movement of multiple barges and cargoes would generate MULTIPLE vessel operator trip reports. In the data entry (into WCSC database),

the primary trip of the VESSEL, over the entire length of the trip, would receive a SINGLE trip record (i.e., a TRIP counter of 1). All other barge reports associated with that vessel's movement would be given a TRIP counter value of zero. In this manner, all cargoes are properly accounted for in the database.

(3) As a consequence, the total number of TRIPS reported in the PTP is slightly under estimated. However, as noted above, the number of "zero" trips for each commodity was provided to allow an accurate count of trips for each commodity.

5. A reasonable estimate of the average tonnage of a given commodity shipped past the point can be determined by dividing the total of TONS (all rows) by the adjusted total TRIPS (i.e., adjusted to include "zero" trips). Because the TONS value includes all cargo shipped (single or multiple barge tows), this estimate of average tonnage represents the overall annual cargo tonnage per tow shipped past the point.

6. Regarding the maximum barge cargo value of 3,200 tons indicated in the 2004 Pass the Point review provided to Enercon (WCSC Request #5938, 9/14/2004), Mr. Lambert indicated that the 3,200 ton value for LNG was a rough estimate of the largest single barge capacity. The CAP_TONS values provided in this latest Pass the Point report gives the maximum barge capacity and should be used if the maximum barge size is needed.

7. Mr. Lambert indicated that it was his understanding that typically 5 to 6 of the larger tanker barges carrying commodities studies here could be involved in (tied together) in a single tow. Thus, he noted, for a conservative estimate one could assume that 6 barges could be tethered in a single tow. However, he noted that such operations and practices should be confirmed by either the USCG or a barge operating company.

Guy Cesare
2/13/06

Contact Info:
Mr. James L. Lambert
Waterborne Commerce Statistics Center
US Army Corps of Engineers
Phone: 504.862.1465
Email: James.J.Lambert@mvn02.usace.army.mil

GGNS
EARLY SITE PERMIT APPLICATION
PART 2 – SITE SAFETY ANALYSIS REPORT

## 2.2.3 Evaluation of Potential Accidents

The design of a new facility to be constructed at the ESP Site is not available at this time. Therefore, this evaluation is based on the analyses of potential accidents which were completed for the GGNS Unit 1 plant. The results of these Unit 1 evaluations were reviewed taking into account the proposed location of a new facility. The results of this approach demonstrate that the conclusions drawn from the analyses for GGNS Unit 1 are appropriate for a new facility located as proposed at the GGNS ESP site. Additional supporting qualitative analysis is provided where necessary, to demonstrate site acceptability where conditions or inputs might have changed from GGNS Unit 1 licensing to the time of this report.

*On the basis of the information provided in Subsections 2.2.1 and 2.2.2* [of Reference 26], *the potential accidents considered as design basis events were determined to be of very low probability. The potential effects of these accidents on the plant were considered, however, in terms of design parameters (e.g., overpressure, missile energies, etc.) or physical phenomena (e.g., concentration of flammable or toxic cloud outside building structures, etc.).*

### 2.2.3.1 Determination of Design Basis Events

#### 2.2.3.1.1 Explosions and Flammable Vapor Clouds (Delayed Detonation)

*Flammable gases in liquid or gaseous state can form a vapor cloud which could drift toward the plant. The drifting cloud's capability of exploding is based on its concentration being above the lower flammable limit concentration for the material being released. The unrestricted vapor cloud is assumed to move downwind toward the plant from the release point originating at U. S. Highway 61 under stable atmospheric conditions and low wind speeds. The effect of overpressure on plant structures caused by delayed detonation of the hazardous material was evaluated to be much less than 1 psi peak reflected pressure due to the distance between the possible detonation points and the plant.*

*The nearest transportation route to the power plant site is the Mississippi River. Its nearest bank is located 1.34 miles from the site facilities. This distance will preclude any damage to plant facilities resulting from potential accidents involving explosion or fires originating from a ship or barge in the river. The largest probable quantity of explosive material transported by ship is approximately 5,000 tons (equivalent TNT) as listed in Regulatory Guide 1.91. Furthermore, most of the plant structures and all of the safety-related structures are located on top of a bluff approximately 65 feet above the normal river level. The bluff provides an earthen shield against explosions of potential river-traffic cargo. Also, any flammable vapor clouds released by a traffic accident in the river*

GGNS
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*would be partially shielded by the high elevated river bank. Therefore no explosive hazard to the plant located 1.34 miles inland is anticipated due to an ignition of the vapor cloud.*

~~The nearest bank of the river is approximately 1.1 miles from the proposed location for a new facility on the GGNS ESP Site. In addition, a new facility would be located on the bluffs to the east of the river, which are approximately 65 feet above the normal river level. As noted above for the GGNS Unit 1 plant, this bluff would provide an earthen shield against possible explosions originating from river barge traffic. Based on the combination of distance from the river bank and the intervening bluff, this would preclude any damage to the structures of a new facility at the proposed location, resulting from an explosion originating from a ship or barge on the river.~~

~~An assessment was performed regarding the transportation of liquefied natural gas (LNG) on the Mississippi River considering the possibility of a barge accident and delayed ignition of the resulting LNG plume on the ESP site. The overall risk was calculated based on the series of events that must occur in order for a flammable plume to reach the site. That is, an LNG container ship of sufficient size must be present within plume range of the site, and then have an accident causing release the LNG. Atmospheric conditions must be correct for a plume to exist and extend towards the site, and an ignition source must exist. The assessment determined that the probability of such a plume reaching the proposed ESP site was approximately 3 x 10-8 per year, and concluded that such an event did not pose a significant risk to the site. Therefore, using the criteria of NRC RS-002, Section 2.2.3, this event is not considered a design basis event for the ESP facility.~~

The ESP site is located just west of the existing GGNS Unit 1 facility. The western edge of the proposed power block area of the ESP site is approximately 1.1 miles from the Mississippi River. An assessment was performed to evaluate potential hazards represented by flammable and explosive cargo transported by the site on the Mississippi River. The approach, methods, results, and overall conclusions were provided to the NRC in Reference 35. The following provides a summary of the assessment approach and conclusions.

An initial screening of commodities included in cargo shipped on the Mississippi River past the ESP site (Table 2.2-4) was conducted to identify those materials that warranted more detailed evaluation, that is, "commodities of interest." This initial screening of the hazardous commodities eliminated all but eight requiring further analysis for potential adverse impact to the ESP site from a river transportation accident. The eight commodities that could not be eliminated were crude oil, gasoline, liquefied natural gas

(LNG), naphtha and solvents, acyclic hydrocarbons, benzene and toluene, alcohols, and ammonia.

For these eight commodities of interest, additional more detailed shipment information was obtained from the U.S. Army Corps of Engineers Waterborne Commerce Statistics Center (WCSC) and used to develop reasonably bounding assumptions regarding the amount of each commodity included in a single barge shipment past the ESP site. This WCSC data also provided shipping frequency (pass-the-point data) for each commodity.

Analyses were then performed for each commodity, taking into account chemical and physical properties, state of the material when shipped, assumed progression of events following the incident that releases the material, reaction kinetics, and release rates. These analyses included the following:

a. Analysis of a confined space detonation
b. Local free vapor cloud explosion, and
c. Evaluation of a vapor cloud formation and dispersion downwind toward the ESP site, with a delayed ignition.

All of the eight commodities were further investigated for the extent of overpressure based on a confined space vapor explosion. The confined vapor cloud explosion scenario assumed that the transport vessel had been breached and sufficient material lost to leave a vapor space filled with an explosive gas mixture. An ignition source is introduced and combustion occurs. Due to the confined space, the internal pressure rises rapidly and eventually ruptures the vessel. The mass of material that can be confined in the hold of the transport is limited, however, due to removal of a significant portion of the commodity being necessary for voiding the space. For the confined vapor explosion analysis, none of the commodities evaluated were shown to pose a hazard of an overpressure greater than 1 psi at the ESP site, although distance to overpressure for gasoline was within 10% of the 1.1 mile standoff distance.

Based on an evaluation for free vapor cloud explosion, certain commodities (i.e., crude oil, gasoline, naphtha, acyclic hydrocarbons, benzene and toluene) were determined to pose some level of risk that would have to be further evaluated. Due to inherent physical properties – deflagration rate for LNG, and solubility in water for the others - LNG, alcohols, and ammonia, as well as certain types of solvents, were determined to be unable to present a legitimate opportunity for a free vapor cloud explosion. For the remaining commodities, an "at-risk" length of the river on which the accident could occur, and in which an overpressure of 1 psi or greater at the site could potentially be created from the explosion, was determined. The "at-risk" lengths on the river for all commodities were determined to be less than 3 miles, the worst case – i.e., from 1.5 miles upstream of the plant to 1.5 miles downstream of the plant.

The potential for deflagrations and detonation in a plume resulting from release of the commodities from a barge accident was evaluated. This evaluation assumed dispersion downwind toward the ESP site, with a delayed ignition. Acetone, methanol, and ethanol are not considered for plume generation since they are water-soluble. In addition, the possibility of a detonation of LNG was not considered based on its properties. For each commodity of interest, the vapor dispersion was determined based on a wind speed of 1.55 m/sec, a stability class of D, and a 90°F ambient air temperature. These meteorological conditions were chosen to maximize the vaporization rate of the commodity of interest while limiting the downwind dispersion.

The release rate from the damaged barge was based on two assumed rupture sizes (holes) of 5 $m^2$ and 1 $m^2$. To maximize barge contents releases, the rupture location was assumed to be on the barge bottom. All commodities were assumed to be at ambient temperature (90°F) except for cryogenic liquids (methane, ethane, ethylene, and propane) which are stored at their normal transport temperature. The assumed release is into the river water, with an assumed water temperature of 83°F (the average mean temperature for July for 1988-92 for the lower Mississippi River at New Orleans), surrounding the damaged barge, since the peak river water temperature will produce increased vaporization.

From this plume analysis, gasoline, certain LNG components, benzene, naphtha, and acyclic hydrocarbons were determined to have the potential to develop a plume which would extend to the site with concentrations above the lower explosive limit for that substance. Acetylene (an acyclic hydrocarbon) was the only commodity in the plume drift analysis that produced a predicted overpressure at the site greater than 1.0 psi.

For those commodities from the above analyses that produced an overpressure value in excess of 1 psi at the site or predicted concentrations at the ESP site above the lower explosive limit, a risk assessment was performed to determine the associated probability of occurrence of the event. Using U.S. Coast Guard databases containing records for marine related spill events, a spill mass vs. spill frequency relationship was developed for incidents on the Mississippi River.

From this relationship and data on commodity shipments past the ESP site and "at-risk" river lengths, the accidental detonation risk (to the site) for each commodity was estimated. The individual risk for each commodity (gasoline, crude petroleum, naphtha and solvents, acyclic hydrocarbons, benzene and toluene) was determined to range from E-08 to E-10 per year. The total risk was estimated to be approximately 2.5 E-08 per year.

A similar assessment was made to determine the risk to the ESP site resulting from spills on the river leading to potential plume extension to the site, a detonation and/or deflagration risk. This assessment considered gasoline, LNG, naphtha and solvents, acyclic hydrocarbons and benzene. The assessment concluded the risk of flammable vapor clouds extending to the site for each individual commodity ranged from E-08 to E-10 per year. The total risk for these commodities was estimated to be 6.5 E-08.

An assessment determined risks associated with transportation events (involving potential explosions and flammable vapor clouds) on the Mississippi River to be on the order of E-08 per year for the ESP site. Events with a probability of occurrence of E-08 are not considered design basis events, consistent with the criteria of Regulatory Guide 1.70 (Rev. 3), Section 2.2.3.1 and NRC Review Standard RS-002 (Section 2.2.3), which indicate a screening criteria for probability of "on the order of about E-07." In that the predicted risk from these transportation related hazards is sufficiently low as to pose no undue risk to a facility proposed to be located at the ESP site, and therefore, the transportation hazards are not design basis events for the site, the site suitability requirements of 10 CFR 100.20(b) and 100.21(c) are considered to be satisfied.

*No military installations, chemical or munition plants, stone quarries, or major gasoline-storage areas are located within 5 miles of the plant site. The chemical storage facilities at Port Gibson, described in subsection 2.2.2, store relatively small amounts of chemicals, and the probability of exploding the two 12,000-gallon underground N-hexane tanks is very small. In the last 25 years, no accidents have been reported. Assuming that an accident does take place, the peak reflected pressure on the plant structures which are about 4.5 miles away from detonation of the 34.5 tons equivalent TNT yield, is negligible (e.g., much less than 1.0 psi).*

*A 4-inch-diameter, 225-psi, gas-transmission pipeline passes 4.75 miles east of the site. Potential explosions, either by immediate or delayed ignition of an unconfirmed natural gas-air mixture, will not endanger the safety of the nuclear station due to the separation distance between the possible detonation points and the plant.*

As indicated above for GGNS Unit 1, no military installations, chemical or munitions plants, stone quarries, or major gasoline-storage areas are located within 5 miles of the GGNS site. In Section 2.2.2 above it was noted that the two 12,000-gallon underground N-hexane tanks are no longer in use; therefore, they do not need to be considered as a hazard for a new facility on the GGNS ESP Site.

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The 4-inch-diameter, 225-psi, gas-transmission pipeline that passes 4.75 miles east of the site is also a non-hazard for a new facility due to the physical separation distance between the pipeline and the facility location.

To support analysis of a highway transported explosive, the maximum probable hazardous cargo for a single highway truck was assumed to be approximately 50,000 pounds (equivalent TNT) as presented in Regulatory Guide 1.91 (Reference 24). Per the Regulatory Guide, the distance beyond which an exploding truck will not have an adverse effect on plant operations or will not prevent a safe shutdown of the reactor is conservatively defined by the relationship:

$R \geq kW^{1/3}$,
where R is the distance in feet from an exploding charge of W pounds of TNT. When R is in feet and W in pounds, the constant k is equal to 45.

Thus, the safe distance is calculated to be 1,658 feet (0.31 miles). Since the closest point of U. S. Highway 61 to GGNS site is 4.5 miles, no hazard to the plant due to an explosion on Highway 61 would be expected.

Liquefied hydrogen is delivered to the GGNS site by United States Department of Transportation (USDOT) approved truck, with a maximum capacity of 17,000 gallons. Liquefied oxygen is also delivered to the site by USDOT approved trucks. There are no regulations specifying a minimum distance between a liquefied-hydrogen delivery truck and a safety-related structure. However, the intent conveyed by Regulatory Guide 1.91 (Reference 24) and the EPRI guidelines (Reference 30) concerning evaluation of explosions occurring on transportation routes near nuclear power plants is that considerable distance be provided, if possible, to mitigate damage that could occur from an explosion of a liquefied-hydrogen truck. The current truck route on the GGNS site results in about 400 ft. separation from the outer boundary of the proposed location for the power block of a new facility, which is less than the minimum separation distance of 1285 ft calculated per Regulatory Guide 1.91 in Reference 15. However, the probability of an accident resulting in a hydrogen explosion calculated (in Reference 15) per the Regulatory Guide 1.91 methodology is $4.1 \times 10^{-7}$ per year. Therefore, according to the guidelines presented in Regulatory Guide 1.91 (criteria is less than $10^{-6}$ per year when conservative assumptions are used), the truck explosion event need not be considered a design basis accident for a new facility on the site. However, it is prudent to maintain maximum separation distance between safety-related structures and the truck route.

The presence of the 20,000 gallon liquid-hydrogen storage tank located in the north end of the abandoned Unit 2 cooling tower basin and the liquid-oxygen storage tank (Figure 2.2-4) present the potential hazard of an explosion or a gaseous cloud. The pressure

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effects resulting from an explosion of the hydrogen tank has the potential of damaging safety-related structures. In addition, a gaseous cloud has the potential of entering a safety-related structure through the air intake of the structure. Hydrogen is an explosion hazard. While an oxygen cloud will not explode, the potential threat from liquid oxygen is the contact of oxygen enriched air with combustible material and the ingestion of oxygen enriched air into safety related intakes. An analysis was performed to determine the safe separation distance between the liquid hydrogen and oxygen storage tanks and any safety-related structure. The following minimum separation distances were calculated. (Reference 15)

| Type of Hazard | Minimum Separation Distance (ft) Explosion | Gaseous Cloud |
|---|---|---|
| Liquid hydrogen storage tank | 737 | NA |
| Liquid hydrogen pipe break; pipe size or hole size of ½"; pipe not seismically supported | 378 | 1340 |
| Liquid Oxygen | NA | 1060 |

These calculations are valid for new construction at the GGNS ESP Site, so long as the minimum separation distances stated in the report are maintained, or structures are appropriately designed for the expected blast pressure. The proposed area for construction of a new facility is beyond the minimum separation distance requirements given in the calculation for both blast considerations and gaseous cloud considerations.

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3.1.5 Potential Offsite Hazards

The potential offsite hazards for the ESP Facility are described in Section 2.2. The description includes nearby industrial, transportation and military facilities.

Sections 2.2.1 and 2.2.2.5 addresses area airports and associated air transportation routes, as they may affect the ESP Facility. No commercial airport facilities are located within 10 miles of the GGNS site. The nearest commercial airport is located in Jackson, MS, approximately 65 miles northeast of the site. There are 5 general/public aviation airports located within the vicinity of the site. These general/public aviation airports are used only for small planes.

As noted in Section 2.2.3, highway accidents are not a concern for the ESP Site. The ESP Site area is accessible by U. S. Highway 61 and State Highway 18 which connect Port Gibson (5 miles southeast of the site) with Natchez, Jackson, and Vicksburg. U. S. Highway 61 passes approximately 4.5 miles east-southeast of the GGNS site at its closest point. The distance beyond which an exploding truck will not have an adverse effect on plant operations, nor prevent safe shutdown, is calculated to be 1,658 feet (0.31 miles). Since the closest point of U. S. Highway 61 to the ESP Site is about 4.5 miles, there is no hazard to the plant due to an accident on U.S. Highway 61.

There are currently no active rail lines in the vicinity of the ESP Site. Therefore, potential accidents involving railway traffic are not evaluated.

The nearest bank of the river is approximately 1.1 miles from the proposed location for the ESP Facility on the GGNS ESP Site. In addition, a new facility would be located on the bluffs to the east of the river, which are approximately 65 feet above the normal river level.~~As noted above for the GGNS Unit 1 plant, this bluff would provide an earthen shield against possible explosions originating from river barge traffic. Based on the combination of distance from the river bank and the intervening bluff, this would preclude any damage to the structures of the ESP Facility at the proposed location, resulting from an explosion originating from a ship or barge on the river.~~ Section 2.2.3.1 provides an assessment of potentially flammable and explosive cargo, shipped on the Mississippi River past the proposed ESP site, and it was concluded that the risks to the ESP site were on the order of E-08 per year. As such, these river transportation accidents are not considered design basis events and pose no undue risk to a facility proposed to be located at the ESP site.