The Navigation Economic Technologies Program

October 2006

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Shipper and Carrier Response to the July – August 2004 Lock 27 Closure

US Army Corps of Engineers®

IWR Report 06-NETS-R-07

Navigation Economic Technologies

The purpose of the Navigation Economic Technologies (NETS) research program is to develop a standardized and defensible suite of economic tools for navigation improvement evaluation. NETS addresses specific navigation economic evaluation and modeling issues that have been raised inside and outside the Corps and is responsive to our commitment to develop and use peer-reviewed tools, techniques and procedures as expressed in the Civil Works strategic plan. The new tools and techniques developed by the NETS research program are to be based on 1) reviews of economic theory, 2) current practices across the Corps (and elsewhere), 3) data needs and availability, and 4) peer recommendations.

The NETS research program has two focus points: expansion of the body of knowledge about the economics underlying uses of the waterways; and creation of a toolbox of practical planning models, methods and techniques that can be applied to a variety of situations.

Expanding the Body of Knowledge

NETS will strive to expand the available body of knowledge about core concepts underlying navigation economic models through the development of scientific papers and reports. For example, NETS will explore how the economic benefits of building new navigation projects are affected by market conditions and/or changes in shipper behaviors, particularly decisions to switch to non-water modes of transportation. The results of such studies will help Corps planners determine whether their economic models are based on realistic premises.

Creating a Planning Toolbox

The NETS research program will develop a series of practical tools and techniques that can be used by Corps navigation planners. The centerpiece of these efforts will be a suite of simulation models. The suite will include models for forecasting international and domestic traffic flows and how they may change with project improvements. It will also include a regional traffic routing model that identifies the annual quantities from each origin and the routes used to satisfy the forecasted demand at each destination. Finally, the suite will include a microscopic event model that generates and routes individual shipments through a system from commodity origin to destination to evaluate non-structural and reliability based measures.

This suite of economic models will enable Corps planners across the country to develop consistent, accurate, useful and comparable analyses regarding the likely impact of changes to navigation infrastructure or systems.

NETS research has been accomplished by a team of academicians, contractors and Corps employees in consultation with other Federal agencies, including the US DOT and USDA; and the Corps Planning Centers of Expertise for Inland and Deep Draft Navigation.

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SHIPPER AND CARRIER RESPONSE TO THE

JULY – AUGUST 2004

LOCK 27 CLOSURE

SHIPPER AND CARRIER RESPONSE TO THE

JULY – AUGUST 2004 LOCK 27 MAIN LOCK CLOSURE

C O N T E N T S

SUMMARY…… iii

1. INTRODUCTION…….. 1

2. PROJECT DESCRIPTION……. 1

3. ADVANCE CLOSURE NOTIFICATONS…… 3

4. SHIPPER SURVEY…… 3
   a. Survey Procedures…….. 3
   b. Survey Responses…… 4

5. CARRIER SURVEY…… 11
   a. Survey Procedures…… 11
   b. Survey Responses ……..……. 11

6. OMNI DATA ANALYSIS…….…….. 15
   a. Introduction……... 15
   b. Chronology of Notices to Navigation Interests…….. 15
   c. Delays …… 16
   d. Arrivals …….. 17
   e. Flotilla Characteristics……... 20
      (1) Barges Per Tow…….. 20
      (2) Percentage Empty Barges…….. 21
      (3) Tons Per Tow……. 22
      (4) Tons Per Day …… 23
      (5) Tons Per Day By Major Commodity Group …… 24
   f. Conclusions ……..…… 25

TABLES

1. Commodity Traffic Through Lock 27, 2000-2004…… 2
2. Commodity Traffic Through Lock 27, 2004……. 2
3. Response Summary Shipper Survey Question 1 ……..…… 4
4. Response Summary Shipper Survey Question 2 …….. 5
5. Response Summary Shipper Survey Question 3 ……..…… 6
6. Response Summary Carrier Survey Question 1 ……..……. 11
7. Response Summary Carrier Survey Question 2 …… 12
8. Response Summary Carrier Survey Question 3 …… 13
9. Response Summary Carrier Survey Question 4 …… 14
10. Average Daily Tonnages by Major Commodity Group …….. 24

FIGURES

1. Average Daily Tow Delays Lock 27, 2004…… 16
2. Average Daily Tow Delays Lock 27, June-September 2004 …….. 17
3. Tow Arrivals Per Day Lock 27, 2003…… 18
4. Tow Arrivals Per Day Lock 27, 2004…… 18
5. Tow Arrivals Per Day Lock 27, July-August 2004…… 20
6. Barges Per Tow Lock 27, 2004…….. 21
7. Percent Empty Barges Lock 27, 2004…… 22
8. Tons Per Tow Lock 27, 2004…….…… 23
9. Tons Per Day Lock 27, 2004 …….…… 24

APPENDIX

A. Shipper and Carrier Survey Forms with Cover Letters

SUMMARY

Between 26 July and 10 August 2004, the main lock chamber at Lock 27, Mississippi River Mile 185.0, was closed to navigation traffic because of needed gate repairs. The auxiliary lock chamber remained available to river traffic during this period. Lock 27 is critical to navigation on the Upper Mississippi and Illinois Rivers and normally passes more than 80 million tons of commodity traffic.

A survey of the shippers and carriers affected by the Lock 27 main lock closure was conducted between 25 February and 28 March 2005 for the purpose of discerning industry reactions to the closure and the associated costs. In addition to the industry surveys, an analysis of the Lock Performance Monitoring System (LPMS) data for Lock 27 was conducted by the St. Louis District. The analysis examined the detailed LPMS data for the Lock 27 facility, particularly for the closure period, to identify changes in operating procedures attributable to the closure, and to draw comparisons with the industry survey responses.

The purpose of the shipper survey was to identify the total economic costs and operational change to industry associated with the closure event. A total of 206 companies were selected to receive this survey. These shippers accounted for about 62.1 million tons of Lock 27 traffic in 2003, which was about 80 percent of total traffic. Completed survey forms were received from 53 companies, representing a response rate of 26 percent. However, a follow-up telephone campaign resulted in an additional 28 replies, increasing the overall response rate to 39 percent. Although shippers had a wide variety of reactions to the closure, over 70 percent indicated that no change in procedures was necessary for their company. This was credited to ample advanced notification and the fact that this closure occurred during what is typically a slow time of year for them. Also, the auxiliary chamber remained in service which helped minimize any disruption. About 10 percent of the companies decided to stockpile product and wait for traffic to clear, and only 6 percent switched to all-overland mode for product delivery from existing sources. Most respondents indicated that a change in long-term transportation strategy was not required, and that no additional costs were incurred.

The major carriers using the Lock 27 facility were also surveyed during this effort. The purpose of this survey was to identify carrier reactions to the closure of the main chamber at Lock 27 and to identify economic costs and operational changes. A total of 22 companies were contacted. Completed survey forms were received from 10 companies, representing a response rate of 45 percent. Through the follow-up telephone campaign an additional 5 responses were received, increasing the overall response rate to 68 percent.
All but one of the responding companies indicated that notification of the scheduled closure was adequate. The majority of companies reacted to the closure by having towboats remain in the queue, or by breaking tows to lock through the auxiliary lock. Several companies participated in industry self-help as a process that was effective in dealing with the situation.

Shippers and carriers were requested, in the survey process, to provide estimates of additional costs incurred as a result of the closure event at Lock 27. Information provided was very sparse from both groups surveyed. In the shippers group, the majority of respondents indicated that no additional costs were incurred. Financial impacts reported ($228,000) were attributed to delay costs, lost revenue, extra labor and overtime costs, and costs to switch to a different transportation mode. Many more of the carriers responded to this question and estimated total costs associated with the Lock 27 closure at $3.9 million. Impacted areas were cited as delay costs for boats and barges, lost revenue for boats and barges, vessel costs, and lost production.

In addition to the survey work, an analysis of the LPMS data for the closure period was undertaken to assess carrier reactions to and the impacts of the closure event. Because tows were compelled to lock through the auxiliary lock, average processing times nearly doubled relative to the pre-closure period. Delays greatly exceeded normal levels during the closure causing over 15,000 hours of tow delay. The maximum delay experienced by a single tow was 104.6 hours (4.4 days). After the main chamber opened, it took about 94 hours for the queue to dissipate and the delays to return to normal. Carriers appear to have reacted to the closure by increasing tow size, decreasing the proportion of empty barges, increasing tow arrivals per day prior to closure, and reducing arrivals at the facility during closure.

SHIPPER AND CARRIER RESPONSE TO THE JULY-AUGUST 2004 LOCK 27 MAIN LOCK CLOSURE

1. INTRODUCTION

The main lock chamber at Lock 27, Mississippi River mile 185.0, was closed to navigation traffic between 26 July and 10 August 2004 for needed gate repairs. The small auxiliary lock chamber remained available to river traffic during this period. The St. Louis District of the U.S. Army Corps of Engineers published two Navigation Notices regarding the main chamber closure. This advanced notice would allow the navigation industry to prepare for the scheduled 14-day maintenance closure.

A survey of the shippers and carriers affected by the Lock 27 main lock closure was conducted between 25 February and 28 March 2005 to determine what measures were taken by industry to mitigate the effects of the lock closure and to estimate the total costs to industry that resulted from the closure event. This report documents the results of those industry surveys. In addition to the industry surveys, an analysis of the Lock Performance Monitoring System (LPMS) data for Lock 27 was conducted. The purpose of this analysis was to examine the detailed LPMS data for the Lock 27 facility, particularly for the closure period, to identify changes in operating procedures attributable to the closure, and to draw comparisons with the industry survey responses.

2. PROJECT DESCRIPTION

The Lock 27 project is located at Mississippi River Mile 185.5, downstream of the St Louis, Missouri urban area. The two locks at Lock 27 are situated at the southern end of an 8.4-mile long, man-made canal, and represented the first major addition to the original 9-Foot Channel Project. After 1940, only a single impediment prevented the maintenance of a safe and reliable 9-foot navigation channel on the Mississippi River from St. Paul, Minnesota, to New Orleans, Louisiana. This impediment, known as the Chain of Rocks Reach, was a 17-mile series of rock ledges that began just north of St. Louis and was extremely difficult and dangerous to navigate.

The Corps of Engineers designed the canal to allow river-borne vessels to bypass the treacherous Chain of Rock Reach to ensure adequate depths in the pool below the old Lock and Dam 26. The Corps of Engineers constructed a non-movable, lower water dam extending entirely across the river. This dam is known both as Dam No. 27 and the Chain of Rocks Dam.

The project has two parallel locks along the left descending bank: a 1200’ x 110’ main lock chamber and a 600’ x 110’ auxiliary chamber. The dam is a 2,500 foot long non-movable, low water dam. The navigation pool is 27.8 miles long and covers 13,000 acres. The project was put into service in 1953.

Lock 27, a highly important link in the Upper Mississippi River Navigation System, is located at the critical transition point on the Mississippi River from a "locking river" north of St. Louis and the "open river" from St. Louis on south. The Lock 27 main chamber is one of the nation's busiest navigation lock chambers. Commodity traffic transiting Lock 27 moves to/from markets in the Gulf Coast, Florida and overseas.

Commodity traffic through the Lock 27 facility for the period 2000-2004 is displayed in Table 1. The 2004 traffic mix is dominated by grain (40.8 percent), followed by coal and chemicals (11.2 percent each), crude materials (11.1 percent), petroleum (9.1 percent), and steel (5.4 percent).

Table 1
Lock 27 Main Chamber
Commodity Traffic 2000–2004
(Millions of Tons)

Commodity	2000	2001	2002	2003	2004	% of Total 2004
Coal	7.7	7.6	7.7	8.4	7.5	11.2
Petroleum	4.8	6.1	5.8	6.0	6.1	9.1
Chemicals	7.9	8.1	7.6	0.8	7.5	11.2
Grain	40.5	39.3	43.8	36.6	27.1	40.8
Steel	4.3	3.2	3.6	3.1	3.6	5.4
Crude Materials	5.6	6.2	5.5	5.9	7.2	11.1
Others	8.2	8.5	7.5	13.9	7.5	11.2
Total	79.1	79.0	81.5	74.7	66.5	100

Source: OMNI Data

As shown in Table 2, 61 percent of the 2004 commodity traffic traveled downbound through the Lock 27 facility. The vast majority of this traffic consists of grain destined for the Lower Mississippi River and export. Upbound coal is destined for utility plants, while petroleum, chemicals and crude materials are delivered to many different industries in the middle and upper Mississippi River basin.

Table 2
Commodity Traffic Through Lock 27 Main Chamber
By Direction, 2004
(Millions of Tons)

Commodity	Upbound	% of Total	Downbound	% of Total	Total
Coal	6.5	25	1.1	3	7.5
Petroleum	2.7	10	3.4	8	6.1
Chemicals	6.0	23	1.5	4	7.5
Grain	0.7	3	26.4	66	27.1
Steel	2.7	10	0.8	2	3.6
Crude Materials	5.5	21	1.7	4	7.2
Others	2.1	8	5.4	13	7.5
Total	26.2	100	40.3	100	66.5

Source: OMNI Data

3. ADVANCED CLOSURE NOTIFICATIONS

The St. Louis District of the U.S. Army Corps of Engineers published two Navigation Notices regarding the main chamber closure. The notice indicated that all traffic would be using the auxiliary lock and that the towing industry self-help program would be in effect. This advanced notice would allow the navigation industry to prepare for an expected 14-day maintenance closure.

The first Navigation Notice was issued on 4 June and announced the lock was scheduled to close from 12 July to 25 July 2004.

The second Notice was released on 9 July and revised the closure dates to be from 26 July to 8 August 2004.

Based on OMNI data, the main chamber closed from 26 July-10 August 2004, an actual duration of 15.4 days. After the main chamber reopened, it took 94.3 hours to clear the queue that developed during the closure.

4. SHIPPER SURVEY

a. Survey Procedures. An OMB-approved Shipper Survey (Control #0710-0001) was used to capture and evaluate shipper reactions to the closure of the main chamber at Lock 27. The purpose of this survey was to identify the total economic costs and the operational changes to industry associated with the closure event. Shippers were defined as companies that receive commodity traffic transiting Lock 27.

A database of all shippers that moved commodities through Lock 27 in 2003 was provided by TVA. The database included information on annual tonnage by commodity group, destination dock name, address and POC. The database was segmented into three groups based on the total number of tons shipped to determine which companies would receive the survey.

Group 1: >1,000,000 tons thru Lock 27 in 2003
Group 2: 100,000 – 1,000,000 tons thru Lock 27 in 2003
Group 3: 50,000 – 100,000 tons thru Lock 27 in 2003

A total of 206 shipper surveys were sent out to all receivers of 50,000 tons or more on 25 February 2005, with a suspense date of 28 March 2005. All surveys were conducted through the mail as funding and logistics prohibited actual on-site interviews. Completed forms were received from 53 companies, representing a response rate of 26 percent from the initial mailing.

A follow-up telephone campaign was conducted to obtain feedback from companies on the mailing list who had not yet responded. Most of the surveys not returned were out of groups 1 and 2, so this effort was focused on companies in those groups. Of the 89 shippers contacted by telephone, 5 submitted a written response and 23 provided limited

verbal responses during the telephone interview. These additional 28 replies increased the overall response rate to 39 percent.

b. Survey Responses.

Overall, most of the shipping companies that responded indicated that the Lock 27 closure experience resulted in very little or no impact on company operations or costs. This was credited to ample advanced notification and the fact that that this closure occurred during what is typically a slow time of year for them. The auxiliary chamber remained in service and it was noted by several companies that this option helped minimize any disruption. The survey questions and a summary of responses follow. Noted in parenthesis following each written comment is the type(s) of commodities handled at the companies that provided the survey response. This is intended to help correlate responses with products moving on the system that were potentially impacted by the closure.

Q1. Did your company have sufficient notice of the scheduled Lock 27 closure to prepare a response plan?

R1.

Table 3
Response Summary Shipper Survey Question 1

Response	Count	Percent
Yes	45	78
No	7	12
No Answer	6	10
Total	58	100

Some companies stated that information about the closure was communicated by industry organizations or through their customers. One warehouse wharf for steel and ferro alloys notified all customers of the closure so they could reroute barges to another facility if needed. A poultry feed mill dock reported that their suppliers shipped from locations not affected by the lock closure. None of the companies that responded "No" provided an additional comment or explanation.

Q2. During the period of closure of the main lock chamber at Lock 27, what was your company's response?

R2. Table 4 includes the number of responses for each response category provided on the survey, and the types of commodities handled at the responding companies.

Table 4
Response Summary Shipper Survey Question 2

Number of Responses	Response Category	Types of Commodities Handled at Responding Companies
40 (written) 23 (verbal)	No change in procedures.	
9	Stockpiled product and waited for Lock 27 traffic to clear.	corn milling plant; wholesale fertilizer; structural steel; barge terminal; asphalt products; industrial chemicals; petroleum refinery; crude oil refinery; specialty chemicals
5	Switched to all-overland mode for product delivery from existing sources.	structural steel; ferro alloys & steel; industrial chemicals; fertilizer & grain; petroleum refinery
2	Switched to different waterway routing for product delivery from existing sources.	grain products; poultry feed mill
0	Switched product source to an entirely new source.	
0	Ceased operations during the period of closure.	
2	Altered production during the period of closure.	fertilizer; steel package goods
4	Switched production to another facility.	steel & ferro alloys; fertilizer & steel package goods; anhydrous ammonia; crude oil refinery
1	Purchased intermediate or final product, rather than produced.	fertilizer & grain
3	Other or combinations of the above.	raw liquid & bulk chemicals; bulk products; petroleum refinery
16	No answer.	

Other Comments:

- Storage tanks are filled through winter and most is sold in April thru June; tanks are refilled in late fall and winter. (fertilizer distributor)
- Because of early notice of closure, stockpiled material was adequate. (general commodities dock)
- Received products before and after, delayed building stockpile for winter. (bulk products handling terminal)
- Scheduled shipments in view of lock closure; the extended schedule became awkward for our scheduling. (petroleum refinery)
- Were able to ship 10% more product via rail, but as 60% of our asphalt moves via barge this did not provide a significant alternative to the closure. (petroleum refinery)

Q3. Which of your commodities and tonnages were affected by this closure?

R3. 53% of those who responded to this question said that none of their commodities/ tonnages were affected by the closure. Table 5 presents the remainder of the responses for the commodities and/or tonnages reported as being impacted and the types of facility that responded.

Table 5
Response Summary Shipper Survey Question 3

Commodities Affected	Tonnages Affected	Type of Facility
Grains, gluten meal, inbound coal, alcohol		Grain processing dock
Coal, salt, cottonseed, steel, pig iron		General commodities dock
Corn		Farmers cooperative
Structural steel	15,000-20,000	Steel corporation
Coal		River terminal
Corn		Feed mill dock
Coke, wire rod, wood pulp		Barge wharf
Fertilizer, steel package goods		River terminal
Sodium hydroxide		Chemical wharf
Sodium hydroxide, methanol, potassium hydroxide		Industrial chemicals
Fertilizer-inbound Grain-outbound	7,200 7,200	Barge dock
Coal, some fertilizers		River terminal
Coal		Power cooperative
Asphalt, fuel oil		Petroleum refinery
Asphalt	32 KBBL	Crude oil refinery
Water treatment chemicals	5-7000 short tons	Chemical dock
Coal		Bulk material terminal

Additional Comments:

- Our storage facility for asphalt products filled tanks before closure and was able to continue to serve customers. (asphalt products)
- Nitrogen terminal sent products to other terminal while lock was down. (anhydrous ammonia, urea ammonium nitrate)
- A specialty chemical dock reported that had the duration exceeded 3 weeks ortho-xylene and DEG would have been affected. (specialty chemicals)
- A bulk load/unload terminal reported that barges came in larger numbers at one time, instead of being more spread out. (bulk materials)

Q4. If a reasonable estimate can be made, what additional costs (over and above normal operations) did you incur as a result of the closure event at Lock 27? If possible, please itemize according to the categories in question 2.

R4. For this question, 43% of the respondents incurred no additional costs and another 28% replied as N/A (not applicable), which may or may not mean no additional costs incurred. Other information provided regarding additional costs or impacts included:

- The only additional cost would be the cost of delays. (corn milling plant)
- Increase some to our customers. (river terminal)
- Costs not available – could have affected the price of corn. (poultry feed)
- Truck wood pulp. (bulk unloaded & red. mix)
- Able to schedule any shipments around this time period. (river terminal)
- Lost revenue led to more cost; did not lay off people. (fertilizer, steel package goods)
- Product is owned by our company, closure caused us to stockpile more product at our terminal. If closure had lasted longer we would have run out of product. (terminal/storage facility for asphalt products)
- More labor to off-load railcars rather than barges=$5,000. (raw liquid, bulk chemicals)
- Fertilizer switched to rail=$108,000 added cost. Grain switched to rail=$36,050 added cost. Total added costs=$144,050. (fertilizer-inbound/grain-outbound)
- Coal-increased overtime due to more concentrated fall season, difficult to estimate, roughly $5,000. (bulk products handling & storage)
- $48,775 lock-related demurrage charges. (petroleum refinery)
- For 1 tow, about $25,000 in expense. (crude oil refinery)
- We had storage to work through delays-[minor]. (water treatment chemicals)

Q5. Has the closure at Lock 27 caused your company to alter its long-term transportation strategy (e.g. switch to all-overland modes, increase stockpiles, etc.)? How will this impact your total commodity transportation or other costs (per year)? Please explain.

R5. Of the 51 responses for this question, 78% stated that no change in transportation strategy occurred as a result of the Lock 27 closure, and 12% replied N/A (not applicable) which may or may not indicate no change. Additional comments offered include:

- No change-as long as the auxiliary lock was available. (corn milling plant)
- We have seen our customers switch to rail. (fertilizer, steel package goods)
- The closure of Lock 27 permanently would probably close our terminal. We are not capable of receiving product by rail to keep up with the demand for the product. (terminal & storage facility for asphalt products)
- Increase stockpile. (corn & soybeans)
- We still want to ship by barge as long as we can. (fertilizer-inbound, grain outbound)
- With sufficient notice (3-4 months) we would attempt to stockpile feedstocks. (chemicals)

- Long-term strategy has not changed due to this temporary event. (crude oil refinery)

Q6. Has the closure at Lock 27 caused your company to take any other long-term permanent measures? (switch production to another facility, purchase intermediate or final product rather than produce, etc.) How will this affect your company's long-term operating costs (per year)?

R6. There were 50 responses to this question. 80% said there was no affect on long-term operating costs, 12% said N/A (not applicable) which, again, may or may not indicate no change. Additional comments offered include:

- It has increased the spread in costs to move barges to Granite City over St. Louis by $.50/ton. (fertilizer & steel package goods)
- It would take 35 rail cars or 133 tractor trailers to haul as much as one barge. The freight would not be cost effective for our company. Don't know what the exact costs would be. (terminal & storage facility-asphalt products)
- No impacts – as long as it's not something that will not happen more often. (fertilizer-inbound/grain-outbound)
- Typically our facility would maintain minimal feedstock inventory. We do not have sufficient storage capacity to plan around a two to three week outage-given enough time to plan for the event. (chemicals)
- We have other sources to handle need. Extended outages would lead to higher over-the-road freight charges-[$100-200k per week of outage]. (water treatment chemicals)

Q7. Has your company been impacted by other navigation system disruptions? Did they influence your response to the Lock 27 closure?

R7. There were 48 responses to this question. 52% said their company was not impacted by other navigation system disruptions, and 6% said N/A. 27% indicated that their company had been impacted and offered the following responses to clarify their answer:

- Yes-Ohio River closure was worse because of the time to repair. (general commodities)
- Yes, we have been affected. From past experiences, we were able to plan accordingly. (structural steel)
- Yes, company has been impacted; No, it did not influence response to Lock 27 closure. (poultry feed)
- Yes, low water when Missouri River navigation ends. No, did not influence response to Lock 27 closure. (river terminal)
- Yes, but in this case closing was of such short duration and timed to fall in between wheat and corn/beans harvests that it had no material impact. No operational changes were made. (bulk agricultural products)
- Yes, low water on the Missouri River. (fertilizer-inbound/grain-outbound)
- Yes. Company impacted by system disruption. No, did not influence response to closure. (coal-fired electricity)

- Yes. Montgomery Lock [MP 31.7 Ohio]; Belleville Lock [MP 203.9 Ohio]; McAlpine Lock [MP 606.8 Ohio]. (terminal services)
- Yes. There was some Ohio River and Tennessee River lock issues that affected us but we were informed and able to schedule around them by increasing inventories prior to the closures. This is not without some costs but we fully appreciated the need to work on the locks and value the Corps' diligence in maintaining the system. We generally have enough notice to plan so we are able to minimize the impacts. (petroleum refinery)
- Yes. We have looked at changing production during some outages at locks along with employing barges as floating storage to maintain production during lock outages. (crude oil refinery)
- Yes, 1994 Mississippi River flood, ice jams during some winters. (specialty chemicals)
- Yes, ice closures. Yes, to have a solid backup plan. (water treatment chemicals)
- Yes. Any lock closure on the Inland Waterways has an impact as to the timely arrival of materials/barges. (barge terminal-bulk materials)
- Yes - low water in St. Louis Harbor. No-didn't influence response to closure. (fertilizer)

Additional responses include:

- We have not had major disruptions except for flooding when navigation is shutdown. (corn milling plant)
- Only significant issue-flooding. Traffic thru locks at times is slow. (grain/bulk commodities)
- Sometimes [impacted]. (river terminal)
- Any time a lock is closed it creates a problem for the owner of the product being shipped. (terminal/storage facility-asphalt products)
- We are always on watch for lock delays preventing us from receiving timely freight. (corn/soybeans)
- Not since 5/28/2004. (chemicals)

Q8. Other Comments.

R8. The majority of the written comments provided in response to this question reiterate that with sufficient notification most companies are able to survive short-term lock closures with no or minimal impacts to business.

- Our nitrogen fertilizer company has two seasons, April and May/June, for which storage tanks are filled in October thru January. There is also a short fall season for anhydrous NH3 in November, December. A period of several weeks that locks were closed did not affect us in any way. As long as there is sufficient notification, we should be able to schedule around any short time closure. (nitrogen fertilizer)
- We are concerned about the long term viability of the navigation system and support the Corps' rebuilding and lock lengthening so we will be able to continue shipping by water for a long time. (corn milling plant)

- Disruptions caused by non-scheduled events would cause a great deal of costs. The sooner we know, the better. (general commodities)
- Please note that my answers are for this location, not our company as a whole. We have many locations along the inland waterways conducting a variety of loadings and unloading. (grain terminal)
- Tennessee River closings affect our operation more, but notice is early and stockpiling is used. (grain elevator)
- We purchase corn at a negotiated contract tonnage and price. Supplier is responsible for logistics of delivering product. (grain/bulk commodities)
- Short duration close, no other viable economic way to ship grain to gulf port other than by barge. Grain purchased during prior year's harvest at river shipment basis. (bulk agricultural products)
- We suffered no ill effects this time but have had to curtail loading and curtail hours in the past when there was insufficient freight above the delay locks. (corn/soybeans)
- Lock 27 closure had not impact on our business. (lime & limestone products)
- It was our off-season and did not affect us. (fertilizer storage)
- Thank you for the concern about potential business interruptions. (chemicals)
- This Lock 27 closure was transparent to our company, mainly due to our barge traffic for base oil is low in July and August. (oil & glycol packaging facility)
- This lock closure did not affect our steel deliveries by barge. (barge/ship building)
- Probably could have provided more detail about the costs associated with the #27 outage if asked to comment within a few weeks of the closure as the details have faded with time. That being said, I am glad you are asking about the effects now. (petroleum refinery)
- Since we do not own or schedule the products and barges, we do not have a great amount of extra cost. The customers could possible have demurrage on barges when we receive large numbers of barges at the same time due to a lock closure. (bulk materials terminal)

These additional comments were provided during the follow-up telephone interviews.

- No impact/not affected.
- Cost more to farmers when the locks and dams are down.
- Little or minimal affect, if any at all.
- It was closed during our slow time.
- Assets are required by headquarters.
- We only load or unload barges.
- No cargo coming into the business.
- We don't ship things in that area so we are not affected.
- We only rent out barges and it's for 5 years; this wouldn't have any affect because of the contracts being so long.
- This didn't affect me so I didn't respond.
- Not affected as long as it's in the month of August.

5. CARRIER SURVEY

a. Survey Procedures. The OMB-approved Carrier Survey (Control #0710-0001) was a more targeted survey conducted of the major towing companies that normally use Lock 27. The purpose of this survey was to identify carrier reactions to the closure of the main chamber at Lock 27.

For the carrier survey, two separate databases were provided by TVA. The barge operator database included information on operator name, address, POC and tonnage, by commodity group, that traveled through Lock 27 in 2003. The towboat operator database included operator name, address, POC, and the frequency of trips through Lock 27 in 2003.

A total of 22 carrier surveys were sent out - 13 to operators with a frequency of 50 or more trips through Lock 27 during 2003, and 9 to operators who transported more than 1,000 tons of commodities through Lock 27 in 2003. Completed survey forms were received from 10 companies, representing a response rate of 45 percent. Through the follow-up telephone campaign all of the carriers who had not yet responded were contacted, and an additional 5 written responses were received, increasing the response rate for this group to 68 percent.

Total 2003 traffic reported in OMNI for Lock 27 was graphed by commodity group. This information was compared to the barge and towboat operator databases as a check to be sure that the selected survey sample was representative of the major commodity groups being transported through the Lock.

b. Survey Responses. The actual survey questions and responses are provided below. Noted in parenthesis following each written comment is the type(s) of commodities handled by the company that provided the survey response. This is intended to help correlate responses with products moving on the system that were potentially impacted by the closure.

Q1. Did your company have sufficient notice of the scheduled closure at Lock 27 to prepare a response plan?

R1.

Table 6
Summary Response Carrier Survey Question 1

Response	Count	Percent
Yes	13	86
No	1	7
No Answer	1	7
Total	15	100

Q2. How did your company operate during the scheduled main chamber outage at Lock 27?

R2. Table 7 shows the total number of responses received for each response category provided in the survey for this question. Multiple responses were accepted.

Table 7
Response Summary Carrier Survey Question 2

Number of Responses	Response Category	Types of Commodities Handled at Responding Companies
3	Barges were tied up at fleeting areas; towboats operated elsewhere in the system	heavy marine construction equipment; ag products, stone, coal; iron & steel products
10	Towboats remained in queue with barges	grain, iron, steel, coal, fertilizer, wood products, cement, chemicals, petroleum products, liquid products, dry cargoes
0	Towboats (light) held positions in queue.	
4	Tows were dispatched ready-to-lock at Lock 27.	grain, iron, steel, coal, ag products, stone, fertilizers, dry cargoes
10	Tows were broken to lock through the auxiliary lock.	grain, steel, coal, wood products, fertilizer, petroleum products, chemicals, dry bulk, stone, liquid products
4	Towboats (light) participated in industry self-help.	fertilizer, coal, stone, steel, grain, wood products, chemicals, liquid products
8	Towboats tied off barges and participated in industry self-help.	fertilizer, coal, stone, iron, steel, grain, wood products, cement, chemicals, petroleum products, liquid products, dry cargoes
3	Company avoided the lock when possible.	ag products, coal, stone, petroleum products, aggregate, heavy marine construction equipment
1	No answer.	
2	Other (please explain)-see below	

Other (please explain):

- Our business does not allow us to avoid the lock. We work hard to make the best of the situation. (miscellaneous products)
- Our company had little traffic thru the lock during this time. (liquid products)

Comments:

- Our dock facility is located just north of Lock 27 in the forebay (bulk SU). All empty barges needed to lock thru northbound, and all loaded barges locked southbound back to St. Louis. (grain products, steel, coal)
- Our primary operating procedures, as a unit towing company, allowed us to use the auxiliary lock with no adverse impact to our operations. (fuels/petroleum products)
- Our boats waited in queue with their tows and locked thru the small chamber. There was considerably more waiting time to lock. (grain, coal)

Q3. If a reasonable estimate can be made, what additional costs (over and above normal operations) did you incur as a result of the closure event at Lock 27?

R3. Table 8 lists the information provided on additional costs incurred as a result of the closure event. One company that moves refined petroleum products reported that due to contract agreements, all additional costs were reimbursed by shippers. Also, one carrier of petroleum products reported no additional costs were incurred, crediting the availability of the auxiliary lock for preventing adverse impacts.

Table 8
Response Summary Carrier Survey Question 3

Impact	Additional Costs Incurred	Types of Commodities Handled at Responding Companies
Several operating hours while waiting could not be recovered	No estimate given	Grain, steel, coal
Delays of boat & barges	$240,000 for 72 hrs	Fertilizer, coal, steel, stone grain, wood products
Not identified	$1,200 per day (for 15 days=$18,000)	Marine harbor service
Lost boat hours	2234 hrs x $350/hr = $781,900	Grain, coal, fertilizer, cement, steel, chemicals
Lost revenue with asphalt	$18,000 for every 24 hours (est. $270,000 for 15 days)	Asphalt, heavy oils
Lost revenue from delays	$900,000	Dry bulk, petroleum products
Vessel cost	$1,000 - $10,000/day (say $5,000 for 15 days = $75,000)	Ag products, coal, stone
Lost revenue for - 25 days lost production-boats 25 days lost production-barges 375 barges waiting	 $275,000 $185,500 $185,000	Coal, steel products, grains, iron, cement, stone, fertilizers
Lost revenue	4500 barge day @ $200/day = $900,000	
Lost time	9.76 days = $43,920	grain, coal

Q4. Prior to the outage at Lock 27, towing industry representatives, in cooperation with the Corps of Engineers, developed some operation procedures that were put in place at the time of the closure. Do you believe this effort was (a) effective, (b) ineffective, or (c) only partially effective? (Please explain)

R4. There were 16 responses given to this question (one company gave two ratings, each based on different criteria). 63% of the responses said the operation procedures were effective, 12% said they were partially effective, and 25% did not select one of these ratings. The ratings, additional comments provided, and the types of commodities handled by the responding companies are provided in Table 9.

Table 9
Response Summary Carrier Survey Question 9

Rating	Additional comments	Types of Commodities Handled at Responding Companies
Effective	Most of the procedures were put in place for the linehaul companies, they did not include the local fleeters that also use the lock.	grain, steel coal
Effective	The industry and COE worked very well together.	fertilizer, coal, stone, steel, grain, wood products
Effective	Working together with self-help and partnering with the Corps is always a win-win situation.	heavy marine construction equipment, aggregate
Effective		marine harbor service
Effective	Contacts within other organization expressed little discontent.	petroleum products
Partially effective	District did not work around clock repairing lock. Any time a main chamber is closed, work should be accomplished 24 hrs/day. Pre-planning & pre-staging of equipment are absolutely essential to effective execution of the work. Compared to the McAlpine project, execution on L/D 27 would be graded a "D".	grain, coal, fertilizer, steel, cement, chemicals
Effective	The queue's were increased from 6 to 6-12 and 12 to move traffic better. Self-help with industry making a place for tie-off strings/cuts made locking faster and more efficient.	grain, coal, fertilizer, steel, cement, chemicals
Partially effective		dry bulk, petroleum products
Effective	Thru continuing partnership with RIAC & the Corps, believe most effective process used.	ag products, coal, stone
Effective		refined petroleum products
Effective	Good communication. More was needed with fleeters in the whole St. Louis harbor just to keep them informed.	
Effective		all liquid products

Unrated comments included for the record are:

- Some tows were on turn but was nowhere in the St. Louis area. This may not have slowed anything down, but it could have by those vessels not helping pull cuts. (asphalt, heavy oils)
- The self-help program of assisting at the lock just reduced our cost to a third party vendor. (coal, finished steel products, iron, aggregates, cements, fertilizers, grains)
- There is only so much that can be done when the big chamber goes down. (grain, coal)
- We had no major delays. (coal, grain, steel, bark, ores, dry cargoes)

Q5. Did the experience with the outage at Lock 27 cause your company to adopt any new operating procedures to accommodate lock outages elsewhere in the system?

R5. Of the 13 responses received for this question, 85% said "No" their company did not adopt any new operating procedures. Three additional comments stated:

- We try to follow all notices of closures or restrictions and participate in RIAC meetings. We were still surprised by the bridge at Lock 15 and the early closures of Locks 3 and 5. (fertilizer, coal, stone, steel, grain, wood products)
- Much of our business is contracted a year in advance. Also much of it is moving imports. (grain, coal, fertilizer, cement, steel, chemicals)
- We worked with you all to help cut down on the time. (asphalt, heavy oils)

6. OMNI DATA ANALYSIS

a. Introduction. This analysis uses the U.S. Army Corps of Engineers Operation & Maintenance of Navigation Installations data, OMNI, to investigate whether shippers and carriers who transited Lock 27 during the scheduled 26 July 2004 main chamber closure, reacted by modifying their tow configurations or arrival patterns.

b. Chronology of Notices to Navigation Interests. The St. Louis District published two Navigation Notices with regard to the 2004 main chamber closure at Lock 27. These notices provide the navigation industry with situational awareness and can be used to help shippers and carriers prepare for disruptive maintenance closures.

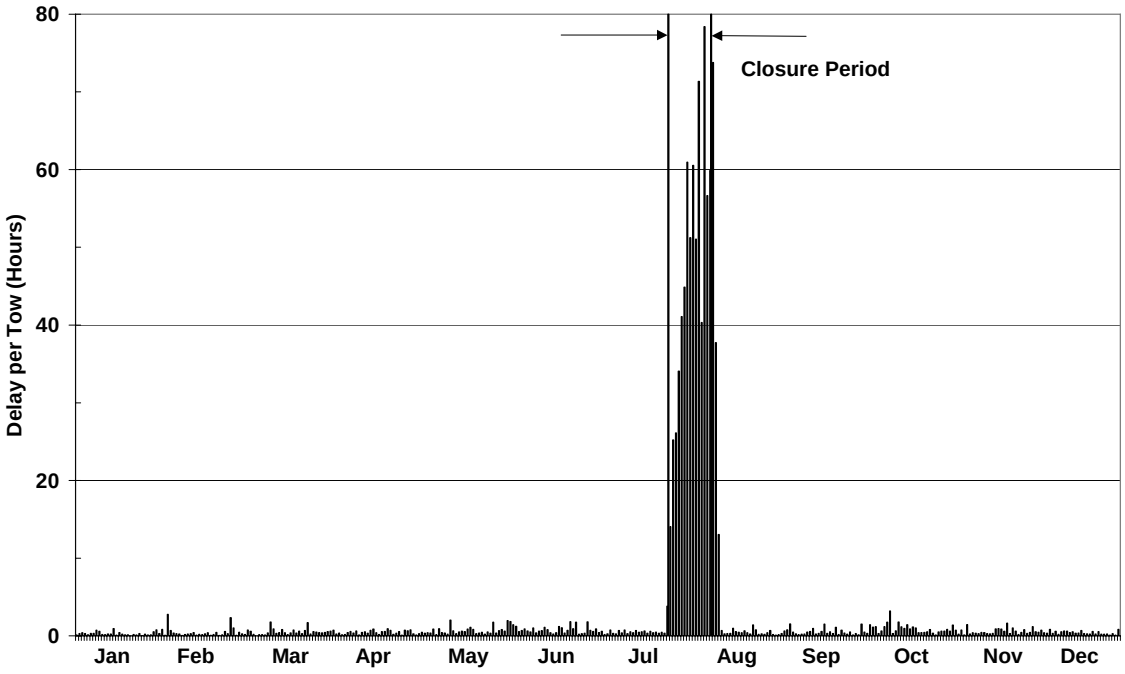
> On 4 June 2004, the St. Louis District issued a Navigation Notice announcing the closure of Lock 27 main chamber. The lock was scheduled to close 12 July and was expected to reopen on 25 July; an expected duration of 14 days.
>
> On 9 July 2004, the St. Louis District issued a revision to the closure dates. The new schedule called for closing the lock on 26 July and reopening on 8 August; an expected duration of 14 days.

OMNI data indicates that the main chamber actually closed on 26 July at 07:10 and reopened on 10 August at 17:50; an actual duration of 15.4 days. After the main chamber reopened, it took 94.3 hours to clear the queue that developed during the closure.

c. Delays.

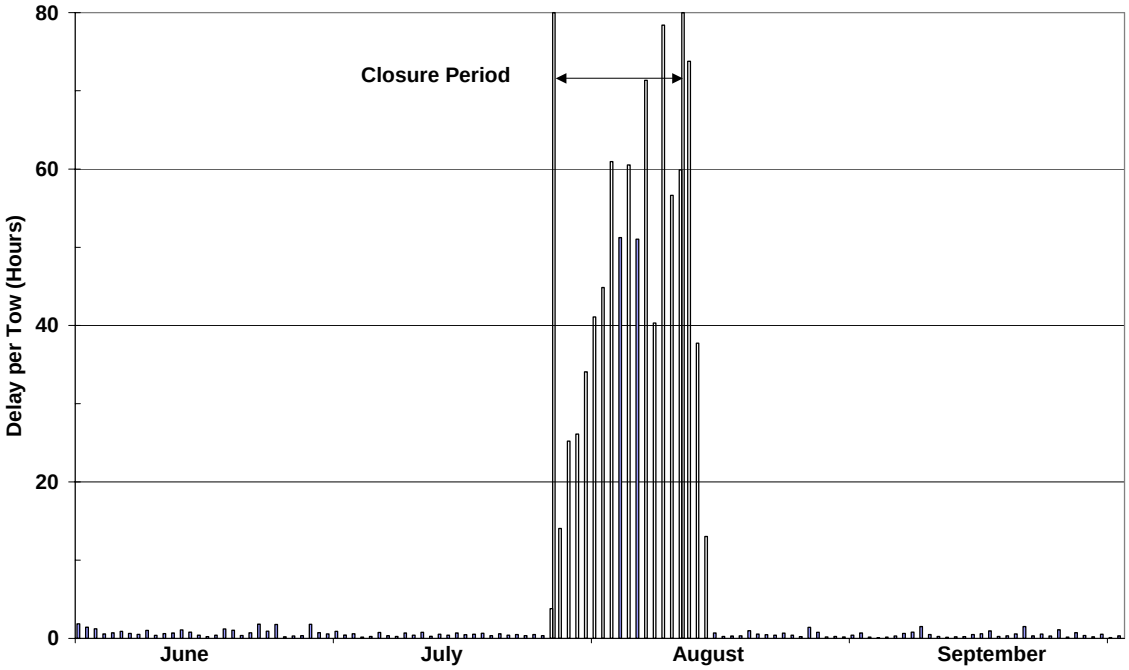
(1) Delays - Entire Year. Figure 1 shows the average delay per tow for each day of 2004. The delay caused by the closure is equivalent to nearly two years of normal operation. The closure caused over 15,000 hours of tow delay, at a cost of $7.8 million. The maximum delay experienced by a single tow was 104.6 hours (4.4 days), with many tows waiting over 2 days before they were served.

Figure 1
Average Daily Tow Delays
Lock 27, 2004



(2) Delays - Closure Period. Figure 2 shows tow delays for the June through September 2004 period. It shows that delays rapidly rose during the first week of the closure, then plateaued at around 50 hours per tow for the remainder of the closure. After the main chamber opened, it took about 94 hours for the queue to dissipate and the delays to return to normal.

Figure 2
Average Daily Tow Delays
Lock 27, June-September 2004



d. Arrivals

(1) Arrivals - Entire Year. One way of determining whether shippers and carriers reacted to the closure is to look at the number of commercial tow arrivals per day. If we can discern that the arrival pattern changed during the closure, we can conclude that the closure caused commercial carriers and shippers to change the way they used Lock 27 during the closure. Figure 3 and Figure 4 show the 3 day moving average of the number of tow arrivals per day, TAPD, for the years 2003 and 2004 respectively.

Figure 3
Tow Arrivals per Day
Lock 27, 2003

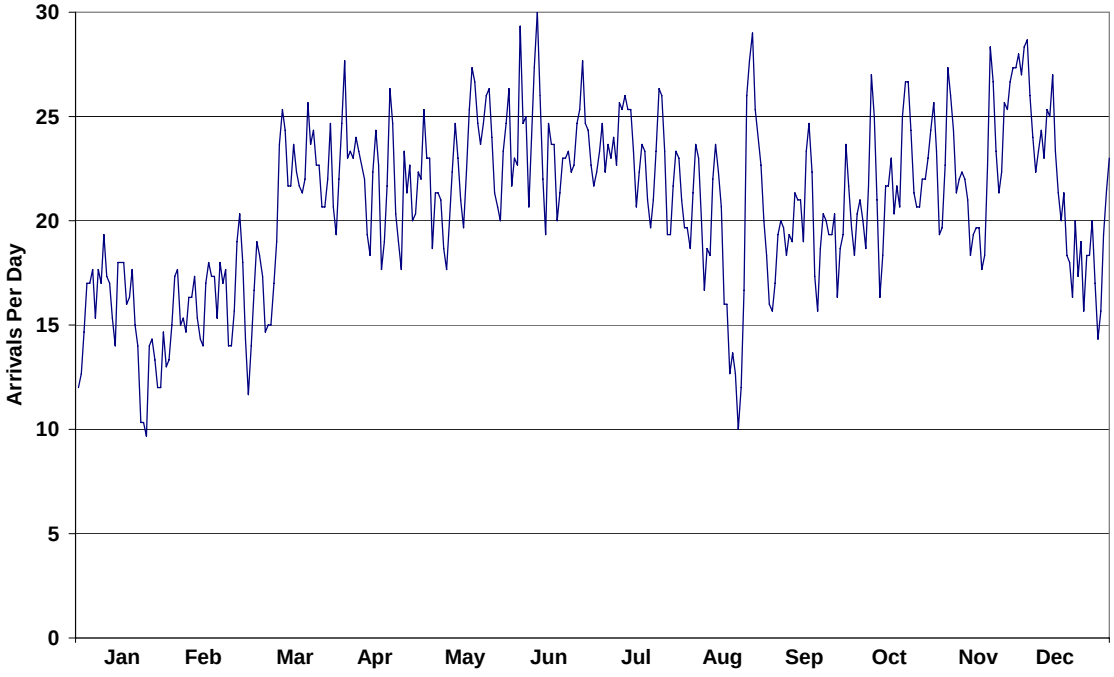
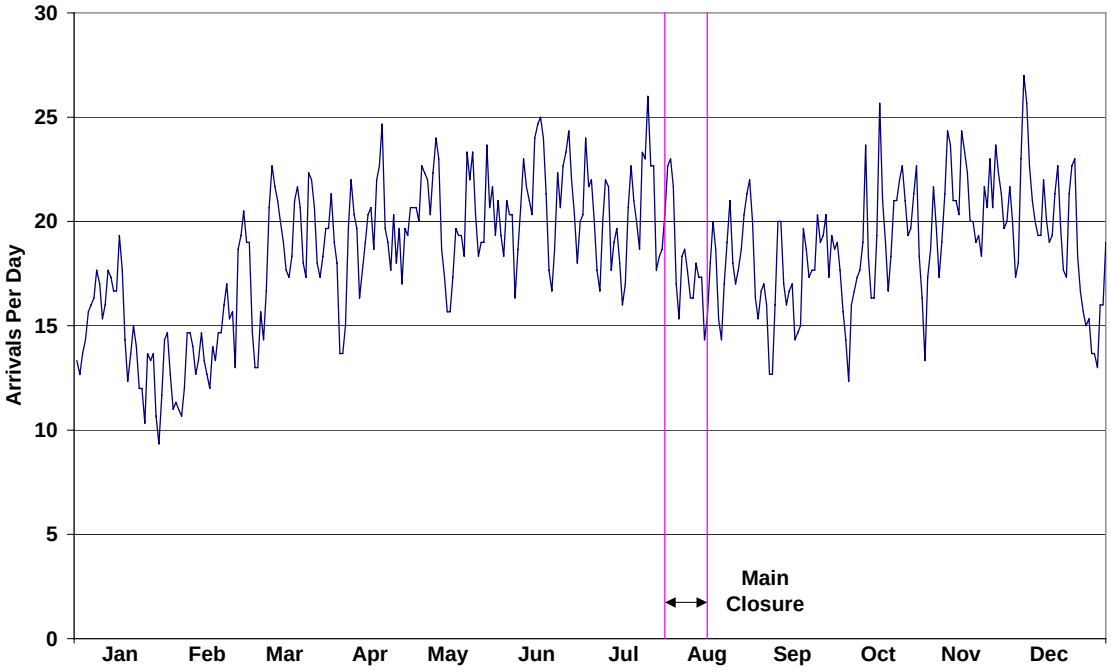


Figure 4
Tow Arrivals per Day
Lock 27, 2004



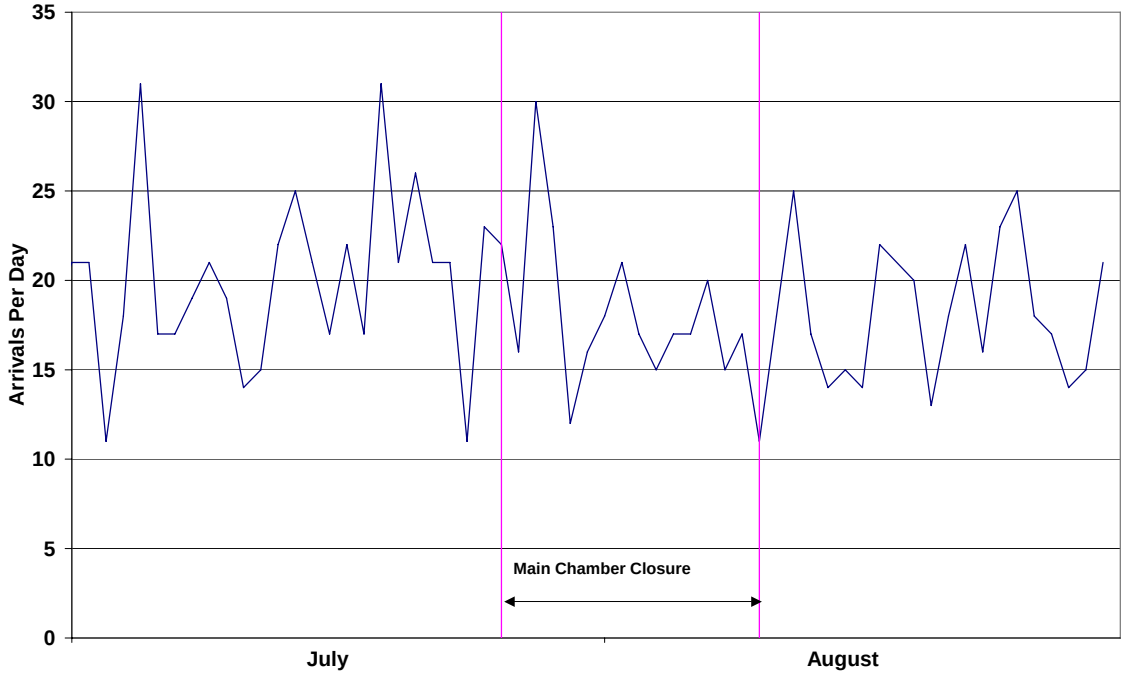
(2) Arrivals – Closure Period. Figure 5 shows the TAPD arrival pattern at Lock 27 for the period July – August 2004.

- For all of 2004, the TAPD was 18.5. This compares with 20.7 for all of 2003 and 21.6 for 2002.
- For the part of 2004 prior to the closure, the TAPD was 18.3.
- For the period from the announcement of a closure to the start of closure, 4 June to 25 July, the TAPD was 20.6.
- The rate was 18.7 TAPD during the closure.
- The TAPD was 17.6 from the end of the closure to the time the queue returned to zero, a period of 94.3 hours.
- For the one month period after the queue returned to zero, 15 August 2004 through 14 September 2004, the TAPD was 17.1.

The TAPD values above indicate the arrival rate has decreased from 2002 through 2004. There was a 14% drop between 2002 and 2004. The overall decline in traffic makes it difficult to separate closure related impacts from long term traffic declines at Lock 27 by looking only at OMNI data. The shipper and carrier surveys are very important in determining whether and how much reaction occurred because of the closure.

Historically, the arrival rate increases sharply just before the closure, and remain relatively high until about 10 days to 2 weeks after the closure began. For this closure, the arrival rate did increase before the closure began. The arrival rate declined by the end of the closure. This phenomenon is common during most historic main chamber closures. Historically, arrival rates remain high, at pre-closure levels, until about ten days after the closure began. By then, delays have risen to high levels. After about the first 10 days of the closure, arrival rates decrease to where they approximate the service rate of the open chamber. For the period after the queue returned to zero, the arrival rate remained low. The reason for this decrease in arrival rates is not known. Perhaps the carrier or shipper surveys could answer this question.

Figure 5
Tow Arrivals per Day
Lock 27, July-August 2004



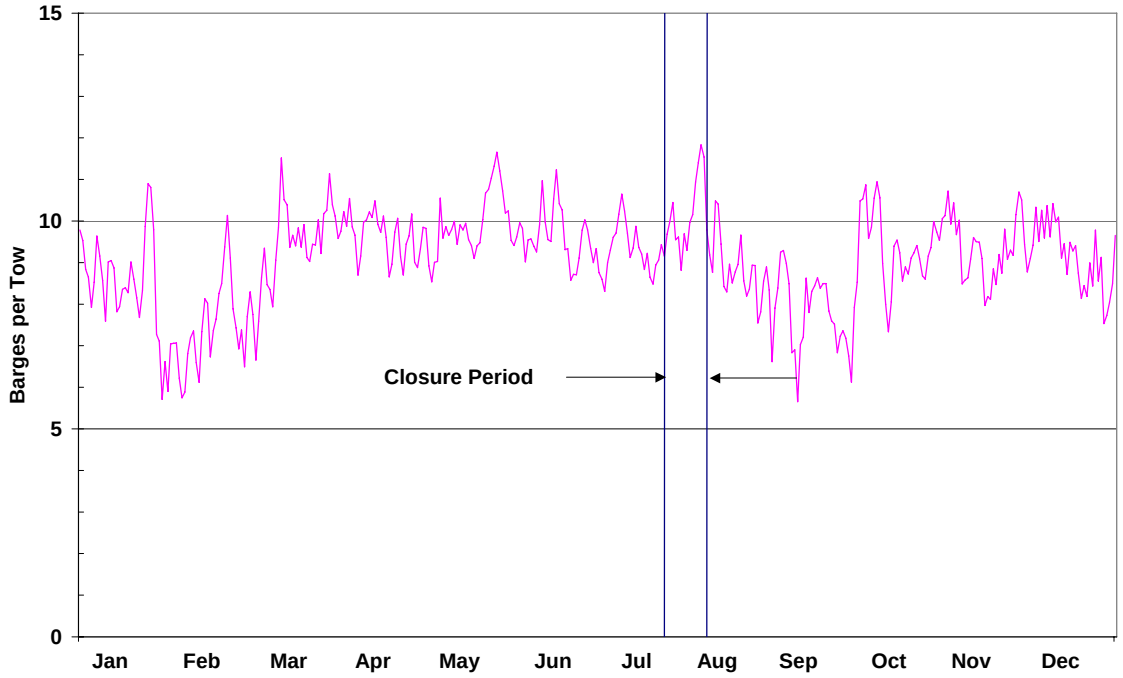
e. Flotilla Characteristics.

(1) Barges per Tow. Another way shippers and carriers could react to the closure would be to change their flotilla configurations, for example, they could push larger tows during the closure. Figure 6 shows the 3 day moving average barges per tow at Lock 27.

- Prior to the closure during 2004, the average barges per tow at Lock 27 was 9.2. This compares with 10.1 during 2002 and 9.6 during 2003.
- Over the entire closure period, the barges per tow at Lock 27 averaged 10.2, 11% higher than the pre-closure period.

Clearly, one of the ways shippers reacted to the closure was to push larger tows.

Figure 6
Barges per Tow
Lock 27, 2004

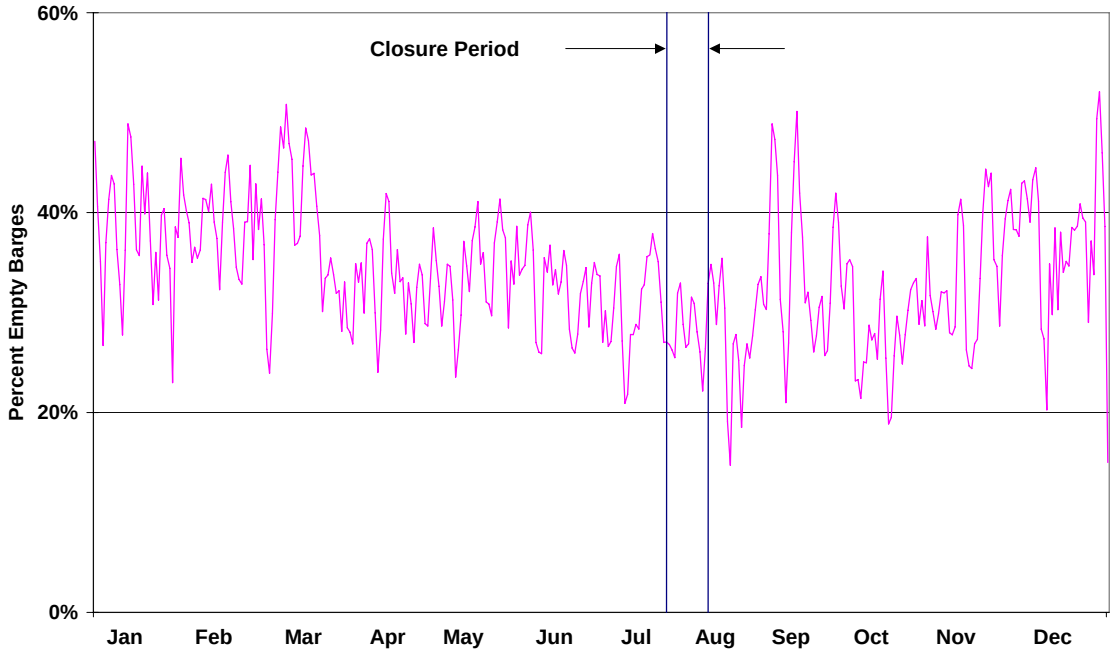


(2) Percent Empty Barges. Another way that shippers and carriers could respond to the anticipated closure would be to push tows that have fewer empty barges. Figure 7 shows the 3 day moving average percent empty barges at Lock 27 during 2004.

- Prior to the closure in 2004, the percent empty at Lock 27 was 35.2%. This compares with 37.4% during 2002 and 37.8% during 2003.
- Over the entire closure period, the percent of barges that were empty averaged 26.9, 24% less than the pre-closure period.

Clearly, another way that shippers reacted to the closure was to push a higher percentage of loaded barges.

Figure 7
Percent Empty Barges
Lock 27, 2004

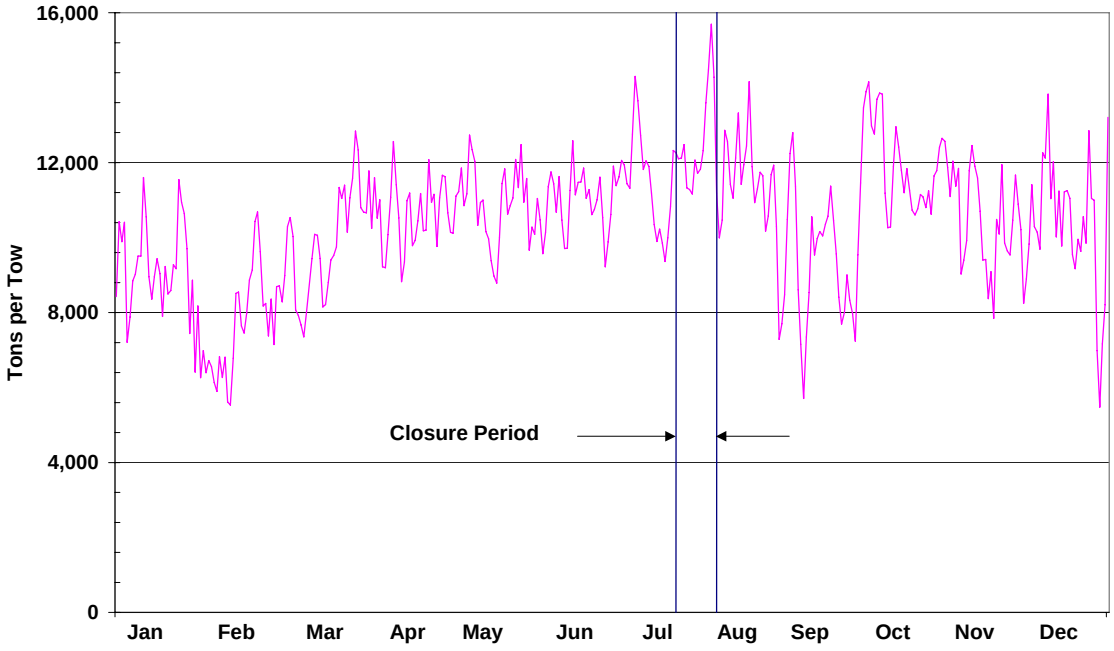


(3) Tons Per Tow. Another measure of whether shippers and carriers reacted to the closure is tons per tow. The value is dependent on the barges per tow and percent empty barges statistics, but will be presented here because it is a good single statistic to consider if we want to know how much tow configuration changed during the closure. Figure 8 shows the 3 day moving average tons per tow during 2004 at Lock 27.

- Prior to the closure in 2004, the tons per tow at Lock 27 was 10,132. This compares with 10,642 during 2002 and 10,232 during 2003.
- Over the entire closure period, tons per tow averaged 10,775, 6% more than the pre-closure period.

This statistic shows that the shippers reacted to the closure by pushing tows that were more heavily loaded than normal.

Figure 8
Tons per Tow
Lock 27, 2004



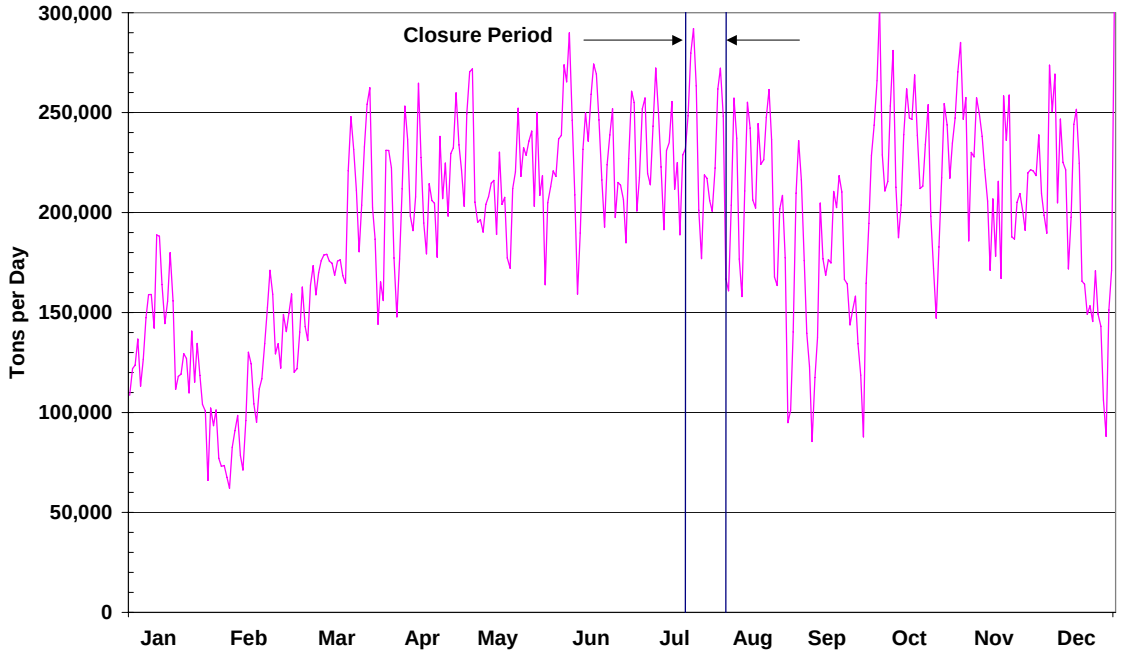
(4) Tons per Day. Probably the most important single statistic to consider when determining whether shippers and carriers were able to continue to move the cargo needed by their customers is the tons per day statistic. If they are able to move the tonnage necessary by reducing percent empty and increasing barges per tow, the ultimate receiver of the product would not be affected by the closure unless the carrier passed on the additional delay cost.

Figure 9 shows the 3 day moving average tons per day during 2004 at Lock 27.

- Prior to the closure, the average tons per day was 184,827.
- Over the entire closure period, tons per day averaged 237,975, 29% more than the pre-closure period.

It appears that the carriers were able to move all the tonnage needed by their customers.

Figure 9
Tons per Day
Lock 27, 2004



(5) Tons per Day by Major Commodity Group**.** Table 10 shows the average daily tonnage at Lock 27 for the periods before, during and after the closure. It shows that all the major commodity groups showed an increase in tonnage during the closure. After the closure, most commodities returned to near the pre-closure levels. However, chemical shipments continued to increase. The shipper and carrier surveys may be helpful in shedding light on commodity movements.

Table 10
Average Daily Tonnages
by Major Commodity Group
Lock 27, 2004

Commodity Group	Pre-Closure Period	Closure Period	Post-Closure Period
Food and Farm Products	89,759	101,310	97,035
Coal	21,597	36,202	21,495
Petroleum	18,287	21,561	18,033
Chemicals	20,550	22,790	23,518
Crude Materials	18,584	28,368	23,291
Manufactured Goods	14,414	25,012	18,677

(f) Conclusions. This document describes an analysis of OMNI data at Lock 27. The following conclusions were reached as a result of this analysis;

- The St. Louis District followed established procedures for notifying navigation interests regarding the main chamber closure at Lock 27.

- Tow delays greatly exceeded normal levels during the closure.

- The number of tow arrivals per day increased during the period following announcement of the closure and decreased during the closure. The shipper and carrier surveys may be able to shed light on this.

- We can be quite certain that carriers reacted to the closure by increasing tow size and decreasing the proportion of barges that are empty. This resulted in a greater amount of tonnage moving through the facility during the closure than normally would have moved if the closure had not occurred.

- Tonnages by commodity increased during the closure with most returning to near pre-closure levels after the closure.

- Immediately notifying industry and then accommodating their request to delay closure allowed carriers to give priority to moving commodity versus positioning empties. The carrier survey should be checked to see if this is affirmed.

APPENDIX A

SHIPPER AND CARRIER SURVEY FORMS

AND

COVER LETTERS

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING - P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF

http://www.mvr.usace.army.mil

February 25, 2005

Executive Office

Dear _____

The Corps of Engineers is conducting a survey of companies that normally ship/receive commodity traffic through Lock(s) 27 at Upper Mississippi River mile 185.5. Your facility has been identified as one such company. If your company functions as a public terminal or transfer facility and is not the final user of the commodity traffic in question, we would appreciate it if you would share this survey form with your customer(s).

As you may be aware, the main lock chamber at Lock 27 was closed for repairs between July 26 and August 10, 2004. The smaller auxiliary lock chamber remained available to traffic during this period. During the closure period, companies whose waterborne commodity shipments/receipts normally transited Lock 27 were faced with some important challenges. Company responses to the closure were varied. Some companies stockpiled product and were able to continue to operate despite the situation at Lock 27. Some companies redirected their commodity traffic to overland modes. Still other companies re-directed production to other plants. All of the measures taken resulted in additional costs to the companies involved.

This survey has been initiated in an attempt to identify the actions taken and the total costs to industry associated with the closure event at Lock 27. An accurate assessment of the total costs to industry will provide important information that will bear on future repair, rehabilitation or other construction-related decisions regarding this important facility.

The attached survey questionnaire contains some fairly detailed questions aimed at identifying the measures taken and tabulating the costs. We would greatly appreciate it if you would examine the questionnaire and answer the questions to the best of your ability. A partial response is preferable to no response. Please bear in mind that any information provided will be treated as confidential and that participation in the survey is voluntary.

Participation in the survey demonstrates support for the continued, efficient operation of the navigation system.

Please return your completed survey form to this office by **March 28, 2005**. Should you have any questions regarding the survey, please do not hesitate to contact Ms. Sharryn Jackson of my staff at (309) 794-5309.

Sincerely,

Duane P. Gapinski
Colonel, U.S. Army
District Engineer

Enclosure

OMB Control # 0710-0001
Expiration Date 11/30/2005

LOCK 27 CLOSURE SHIPPER SURVEY

Date: _____

Firm: _____

Address: _____

_____

Phone: _____ FAX: _____

Point of Contact: _____ E-Mail_____

Title: _____

General Description of Firm and Products Produced: _____

_____

NOTE: ALL RESPONSES WILL BE TREATED AS CONFIDENTIAL

1. Did your company have sufficient notice of the scheduled Lock 27 closure to prepare a response plan? (a) Yes (b) No

Comments: _____

_____

2. During the period of closure of the main lock chamber at Lock 27, what was your company's response?
___a. No change in procedures.
___b. Stockpiled product and waited for Lock 27 traffic to clear.
___c. Switched to all-overland mode for product delivery from existing sources.
___d. Switched to different waterway routing for product delivery from existing sources
___e. Switched product source to an entirely new source.
___f. Ceased operations during the period of closure.
___g. Altered production during the period of closure.
___h. Switched production to another facility.

___i. Purchased intermediate or final product, rather than produced.
___j. Other or combinations of the above. (Please explain.) _____

_____

Other Comments:

_____

_____

3. Which of your commodities and tonnages were affected by this closure?

_____

_____

_____

4. If a reasonable estimate can be made, what additional costs (over and above normal operations) did you incur as a result of the closure event at Lock 27? If possible, please itemize according to the categories in question 2.

_____

_____

_____

5. Has the closure at Lock 27 caused your company to alter its long-term transportation strategy (e.g. switch to all-overland modes, increase stockpiles, etc.)? How will this impact your total commodity transportation or other costs (per year). Please explain.

_____

_____

_____

6. Has the closure at Lock 27 caused your company to take any other long-term permanent measures? (switch production to another facility, purchase intermediate or final product rather than produce, etc) Please explain. How will this affect your company's long-term operating costs (per year)?

7. Has your company been impacted by other navigation system disruptions? Did they influence your response to the Lock 27 closure?

8. Other Comments.

Note: The Corps of Engineers may not conduct and respondents need not respond to a survey questionnaire unless it displays a currently-valid OMB number. It is estimated that the information requested can be gathered in about 30 minutes.

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING – P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF

http://www.mvr.usace.army.mil

February 25, 2005

Executive Office

Dear _____,

The Corps of Engineers is conducting a survey of the major carriers that normally use the Lock(s) 27 at Upper Mississippi River mile 185.5. Your company has been identified as one such company.

As you may be aware, the main lock chamber at Lock 27 was closed for repairs from July 26 until August 10, 2004. During the closure period, companies whose waterborne commodity receipts normally transited the Lock 27 facility were faced with some important challenges. Company responses to the closure were varied.

This survey has been initiated in an attempt to identify carrier reactions to the closure event. An accurate assessment of carrier reactions will provide important information that will bear on future repair, rehabilitation or other construction-related decisions regarding the Lock 27 facility.

We would greatly appreciate it if you would examine the questionnaire and answer the questions to the best of your ability. A partial response is preferable to no response. Please bear in mind that any information provided will be treated as confidential and that participation in the survey is voluntary.

Please return your completed survey form to this office by **March 28, 2005**. Should you have any questions regarding the survey, please do not hesitate to contact Ms. Sharryn Jackson of my staff at (309) 794-5309.

Sincerely,

Duane P. Gapinski
Colonel, U.S. Army
District Engineer

Enclosure

OMB Control # 0710-0001
Expiration Date 11/30/2005

LOCK 27 CLOSURE CARRIER SURVEY

Date: _____

Firm: _____

Address: _____

_____

Phone: _____ FAX: _____

Point of Contact: _____E-Mail_____

Title: _____

General Description of Firm/Commodities Handled: _____

_____

_____

NOTE: ALL RESPONSES WILL BE TREATED AS CONFIDENTIAL

1. Did your company have sufficient notice of the scheduled closure at Lock 27 to prepare a response plan? (a) Yes (b) No

Comments: _____

_____

2. How did your company operate during the scheduled main chamber outage at Lock 27? Check as many items as are applicable and explain any unusual procedures.

___a. Barges were tied up at fleeting areas; towboats operated elsewhere in the system.
___b. Towboats remained in queue with barges.
___c. Towboats (light) held positions in queue.
___d. Tows were dispatched ready-to-lock at Lock 27.
___e. Tows were broken to lock through the auxiliary lock.
___f. Towboats (light) participated in industry self-help.
___g. Towboats tied off barges and participated in industry self-help.
___h. Company avoided the lock when possible.
___i. Other (Please explain). _____

_____

Comments: _____

_____

_____

3. If a reasonable estimate can be made, what additional costs (over and above normal operations) did you incur as a result of the closure event at Lock 27?

_____

_____

_____

4. Prior to the outage at Lock 27, towing industry representatives, in cooperation with the Corps of Engineers, developed some operating procedures that were put in place at the time of the closure. Do you believe this effort was (a) effective, (b) ineffective or (c) only partially effective? (Please explain)

_____

_____

_____

_____

5. Did the experience with the outage at Lock 27 cause your company to adopt any new operating procedures to accommodate lock outages elsewhere in the system? (Please explain.)

_____

_____

_____

_____

Note: The Corps of Engineers may not conduct and respondents need not respond to a survey questionnaire unless it displays a currently-valid OMB number. It is estimated that the information requested can be gathered in about 30 minutes.

navigation · economics · technologies

The NETS research program is developing a series of practical tools and techniques that can be used by Corps navigation planners across the country to develop consistent, accurate, useful and comparable information regarding the likely impact of proposed changes to navigation infrastructure or systems.

The centerpiece of these efforts will be a suite of simulation models. This suite will include:

- A model for forecasting international and domestic traffic flows and how they may be affected by project improvements.
- A regional traffic routing model that will identify the annual quantities of commodities coming from various origin points and the routes used to satisfy forecasted demand at each destination.
- A microscopic event model that will generate routes for individual shipments from commodity origin to destination in order to evaluate non-structural and reliability measures.

As these models and other tools are finalized they will be available on the NETS web site:

http://www.corpsnets.us/toolbox.cfm

The NETS bookshelf contains the NETS body of knowledge in the form of final reports, models, and policy guidance. Documents are posted as they become available and can be accessed here:

http://www.corpsnets.us/bookshelf.cfm

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