SULFURIC ACID BARGE MGM 3030 RESPONSE SUMMARY

Note: The following information was prepared by the NOAA Scientific Support Coordinator (SSC) to provide an overview summary. It is correct to the best of my knowledge, but some of the information was provided to the SSC second and third-hand. This document has not been reviewed. Any information known that is in conflict with that provided should be reported to the SSC as it may influence response discussions and trustee coordination efforts.

Situation Update (23 August 2005):

Lightering of the Tank Barge MGM 3030 was completed the evening of 19 August. The final phase of the response was to safely transit the barge to Galveston for additional temporary repairs and then to a barge cleaning and repair facility near Houston. All indications were that the barge was structurally fit during the transit. Once at a repair facility, the barge was be surveyed for damage, and the United States Coast Guard Marine Safety Unit Galveston would coordinate an assessment and investigation into the failure of the barge.

On 22 August, the Barge MGM 3030 was reported to be awaiting entry into the dry dock at Bloodworth Shipyard on the bayside of Galveston Island. The barge had arrived on Saturday, 20 August, and was thought to be in stable condition. The location of the barge was reported as 29° 17.877' N Lat. 094° 51.030' W Long (see attached map). A three inch hole in the bottom hull had been temporarily patched before transit, and there was no report of loss of residual dilute acid during transit. When the barge left Chocolate Bayou on 20 August, the diluted acid in the hopper and voids were assayed as between 2.3 and 11.4 % acid by weight. A very rough estimate of the volume was reported as 2000 bbls.

By the morning of 23 August, transitory pH values as low as 2 were observed near the barge and additional (maybe new leaks) were identified. Low pH readings have apparently subsided, and the barge is currently taking on water. To help maintain barge stability, dilute acid is being pumped into the #2 Cargo Tank (CT#2). Plans are to transfer the dilute acid to vacuum trucks. Alternative plans are being developed during the writing of this report including a plan to neutralize the residual acid solution in-place. On the evening of 23 August, the volume in the voids was reported as 1000 bbls and the concentration ranged between 1 and 8%. The volume of dilute acid pumped into CT#2 was no reported. The "best guess" of the habitat at risk, should the barge sink, would be an area 1 mile to the east and west of the current location, or roughly between the Causeway Bridge and the bridge to Pelican Island. The direction of plume movement would be tide dependent. The area adjacent to the site is largely industrial, but the bay is a productive fishery. A Resources at Risk summary for the bay side of Galveston Island is attached.

Request for RRT VI Approval (19 August): While every effort had been made to mitigate potential risks to the public and the environment in preparation for barge transit to a shipyard, there were risks. The most likely risk to the environment was that some dilute acid would leak during movement. There was also the potential for failure and sinking of the barge during transit. Both risks are further delineated in this memo.

At the time the barge was moved, a dry dock was to be available on Monday, 22 August. To insure notification and coordination, a request was made for an RRT6 conference call. On 19 August, Regional Response Team VI (RRT6) approved the final operational plan in concept. Monitoring of the pH near the barge was to be maintained during transit. A detailed Operational Transit Plan was prepared by the RP and approved by the Unified Command on 20 August. This memo provides the background information requested by RRT6 and an update. Leaving the barge in place at Chocolate Bayou could not have been considered as an option. The longer the barge remained, the greater the environmental risk to a highly sensitive estuary. The greater flushing rates on the bay side of Galveston Island were also considered to have a greater mitigation affect should there be any loss of acid residues relative to Chocolate Bayou.

Background and Initial Response Actions: While awaiting to discharge cargo, the Tank Barge MGM 3030 was discovered to have taken on water in the forward starboard bow on 15 August 2005 while moored at the Solutia facility on Chocolate Bayou, Brazoria County TX. The barge was loaded with a reported 10,255 bbls of sulfuric acid. The area was remote and mainly used by barges servicing several chemical plants on Chocolate Bayou. Chocolate Bayou is a sensitive habitat and popular area for recreational fishing (see attached ESI Map and Resources at Risk analysis for Chocolate Bayou). The barge was relocated to an area downstream of the facility and pushed in near the RDB on 17 August. A command post was established at the base of State Route 2004 Bridge at a recreational fishing boat ramp and parking area. The current operations do not interfere with private use of the boat launch.

The MGM 3030 has two cargo tanks (CT#1 and CT#2). Initially the sulfuric acid in both cargo tanks remained at or very close to it's the original purity of 96 to 97%. A decision was made to lighter the bulk cargo to a second barge to reduce the threat of a catastrophic failure that would severely impact the bayou and adjacent habitat. Two cargo transfers were conducted and approximately 8500 bbls of 96% solution H2SO4 (acid by weight) were lightered from the MGM 3030 on 17 August. An estimated 1400 bbls (or roughly 60,000 gallons) of cargo remained in CT #2, and was lightered to a third barge on the evening of 18 August. Sampling and analysis indicated that the residual cargo in CT#1 had diluted to 26% by 18 August. All forward void spaces, including the center machinery space, contained dilute acid that assayed between 11.5 and 14.6% on 17 August. This information strongly suggest that there was a common connection between all forward tanks and void spaces, and since water had entered the forward void spaces, there must have been a connection to the bayou (a leak). The stern tank, CT#2, and stern voids are intact at this time.

Environmental monitoring for pH has been conducted throughout the response. The only evidence of acid loss to the environment before arriving at the shipyard was observed on 17 August, and pH values as low 3.1 were measured 500 feet from the vessel. The observed plume dissipated rapidly, and all measurements since (over 36 hours of monitoring) have been at background. By lightering as much product and dilute acid waste from the barge, the threat has been reduced.

On the evening of 18 August, the dilute acid in CT#1, the void tanks, and the hopper were lightered to an additional barge. Residuals remain in the MGM 3030 with a % acid concentration between 2.6 and 11.4%. During the transfer, a hole was discovered in the underside hull and patched for transit. The patch further reduces the potential loss of residual acid to the waterway during transit.

Adding dilute acid to another barge posed some risk, but the options were limited and a barge to barge transfer was thought to not only present the fewest risks, but would reduce the potential negative consequences associated with a failure of the MGM3030 during final transit. The operational plan required that each tank be gauged and assayed for % acid before any final decision on transit. The next phase of the operation was the transit of the damaged MGM 3030 to dry dock facility in Galveston TX – a transit of approximately 25 miles and a transit time estimated at 8 hours. After additional temporary repairs, the barge would be allowed to transit to a cleaning and repair facility near Houston (this plan is subject to change due to the changing situation reported in the situation update). Upon completion of final discharge and cleaning at the repair facility, the barge will be surveyed by the USCG.

Potential Consequences:

There was no way to guarantee that the barge will not suffer a failure, take on water and sink. Lightering the cargo and what dilute acid that could be removed reduced the threat to the public and environmental consequences of such a failure. Since very little concentrated acid remains, the potential to form a super-corrosive solution has essentially been removed (the only risk would be the residual in the intact CT#2, which was reported to be less than 100 gallons, a couple of bbls). Should the barge sink, dilute acid would be released to the environment, and a fish kill near the source is possible. The longer the delay before a transit, the greater the risk since the dilute acid will continue to erode away the internal structures increasing the risk of barge failure and, over time, could produce enough hydrogen gas to increase the possibility of an explosion hazard – venting reduces such hazards. Unlike the incident in Teas City, there is access to the each hold to prevent a pressure build up.

Just how much water would be need to dilute the residual acid on the barge? This is a very difficult question given the accuracy of some of the data. The following is intended to provide a general prospective only such the barge sink at the shipyard location. Our “best guess” is that if there were 2000 bbl of 10% acid solution, a dilution volume of over a billion bbls of water would be needed to reach pH 6. Not all of the acid would be lost at once, and since even 10% acid solution is still heavier than the adjacent seawater, the acid would slowly escape if the vessel sank and seek the deeper water of the dredged shipyard and adjacent channels. The rate of release is very difficult to estimate. The natural buffering capacity of seawater would also reduce the impact of the acid as well as reactions with organics in seawater. If we combine what we know about the bathometry and tidal currents at the present location with the rough dilution estimation and an unknown leak rate from the barge, the best guess is that an area roughly one mile east and west of the barge and extending one mile out would be at risk. The direction of plume movement would be tidally driven, and while the release might continue for a few of days, the threat area would be reduced each day as the source strength of the residual acid decreased.

Note: Since this was written initially, the volume of dilute acid and the concentration have both decreased due to pumping from the hopper and voids to CT#2. At present, 23 August PM, it was reported that the volume may only be 1000 bbls and the acid concentration has dropped to 1 and 8% depending on the tank analyzed. Relative to the area of impact, the area would decrease and the period of exposure would be less. Given the wide range of unknowns and being conservative, the same threat area should be used for planning purposes. In addition, the volume of dilute acid in CT#2 that has not been transferred to trucks would also create a threat.

General HAZARD Characterization:

Sulfuric acid is a colorless, viscous liquid having a specific gravity of 1.8357 and a normal boiling point of approximately 274°C. It is strongly acidic and at high concentrations reacts vigorously with water, organic compounds, and reducing agents. Sulfuric acid is not combustible; however, fire may result from the heat generated by contact of concentrated sulfuric acid with combustible materials. The most imminent threat in a barge taking on water scenario would be the water entering the hold where the sulfuric acid is stored. Two possible events of water mixing with the sulfuric acid: One, if the sulfuric acid is above 80-90%, then the heat from water mixing with the acid will be extreme and will result in increased pressure, which could lead to a possible explosion. Two, the more water entering the sulfuric acid will increase the corrosive property of sulfuric acid and metal, and will result in the liberation of hydrogen gas, which may explode if ignited. Sulfuric acid reacts with most metals, especially when diluted with water, to produce highly flammable hydrogen gas. Carbon steel, cast iron, as well as certain alloys and stainless steels are suitable for acid concentrations equal to or greater than 93%. The resistance of alloys to sulfuric acid corrosion increases with increasing chromium, molybdenum, copper and silicon content. However, the effect of lower acid concentrations on materials of construction can be very complex. Therefore, the corrosivity of sulfuric acid solutions depends on factors such as concentration, temperature and acid impurities.