Investigation and reconciliation of cargo quantities for B 120 oil spill at Buzzards Bay, April 2003

Preamble

On May 22, 2003 the undersigned surveyor from Independent Maritime Consulting Ltd. was asked to investigate and determine how much oil was spilt from the Bouchard barge B 120 in the vicinity of Buzzards Bay, Massachusetts. The spill was due to the barge being holed from contact with the seabed or an object on the seabed in April 2003. This work has been performed at the specific request of Mr Stan Chelluck, COO of Bouchard Transportation Co. Inc.

Our brief was to form an opinion as to the amount of oil that was spilled on the basis of independently prepared cargo inspection documents and provide the most accurate possible estimate to Mr. Chelluck.

The writer has 37 years experience of measuring quantities of oil on ocean going ships, barges and river barges. His professional resume is attached as **Appendix A**.

Cause of the spill

The oil leaked from barge tank No. 2 starboard from a hole in the bottom of the tank, close to the center line bulkhead, said to be approximately 12 feet by 2 feet.

Overview of the movement of the oil cargo on board the B 120

The cargo of heavy fuel oil was loaded on the Delaware River on April 23 to April 24 at Hess, Delair and at Coastal, Eagle Point, New Jersey. The oil from these two terminals was commingled on board. The first parcel of oil had an API Gravity of 6.3 and the second parcel of oil had an API Gravity of 8.9. After loading we calculate that the cargo on board should have had an API Gravity of 7.7. Shore tank figures for the quantities loaded on the B 120 were not available.

The barge was towed from the Delaware River towards its discharge destination in New England. While on passage the cargo was heated with the barge's thermal oil heating system in order to maintain the temperature of the cargo after loading. The temperature after loading was recorded as being an average of 139.6^{o} Fahrenheit. On the afternoon of April 27, 2003 shortly after entering Buzzards Bay it became apparent that the No. 2 starboard tank on the B 120 had been holed. Various actions were taken on board to stabilize the situation and later the clean oil barge B 10 was brought alongside to receive cargo and oily water from the B 120. As a result of the damage to 2 starboard tank the B 120's cargo heating system for 2 starboard was damaged and the heating system for the whole barge was temporarily out of service.

After a transfer of part of the cargo and oily water from the B 120 to the B 10 both barges proceeded to Mirant, Sandwich to deliver the majority portion of the sound cargo (cargo not contaminated with water) to shore tanks at Mirant, Sandwich.

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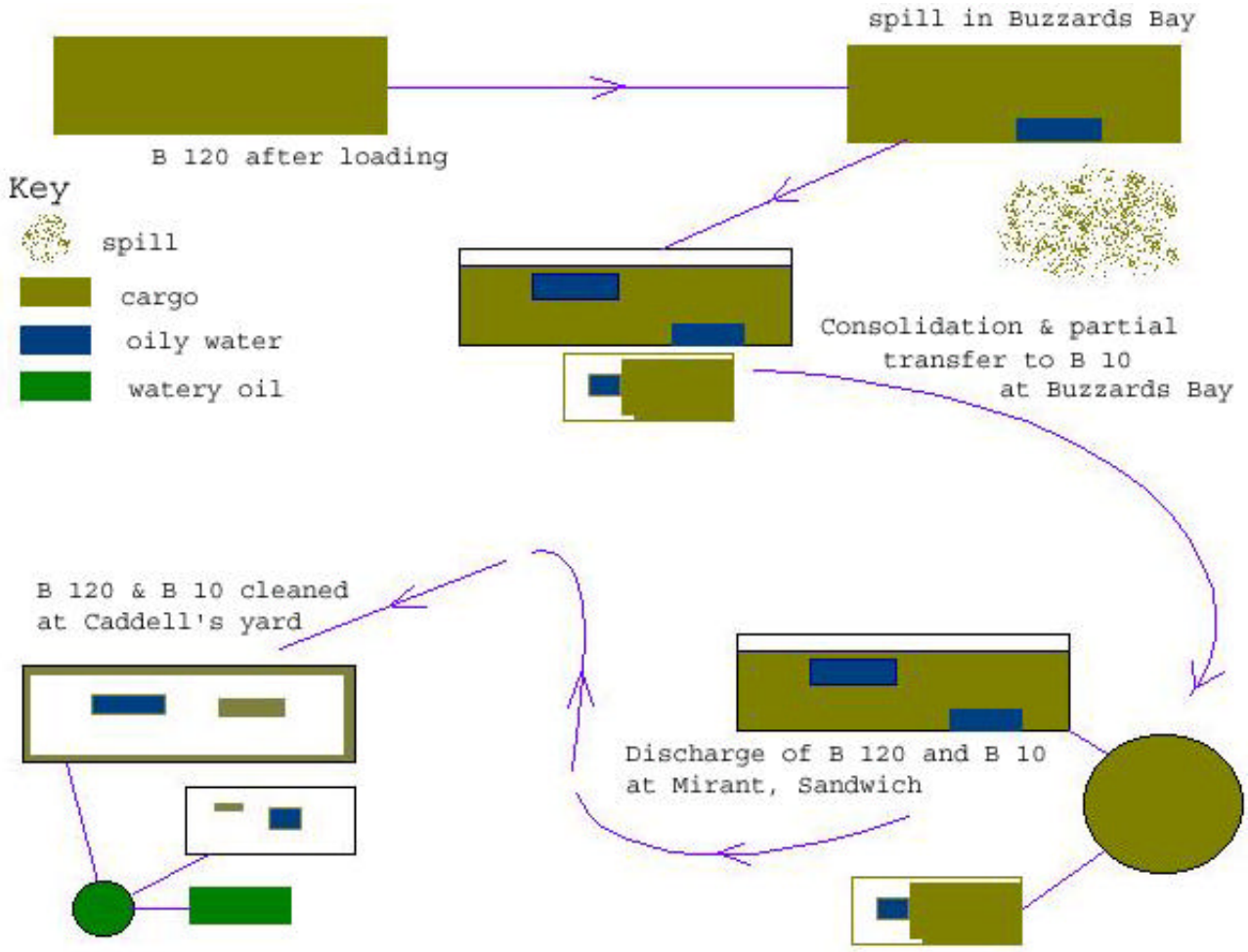
Schematic diagram of the cargo movement



The B 120 and B 10 were then both taken to Caddell's ship yard at Staten Island, New York. When they left Mirant, Sandwich they had on board considerable quantities of unpumpable cold oil and large quantities of oily water that was retained on board for proper disposal at Caddell's tank cleaning facility. On the B 120 there was 1,759.65 barrels of oily water and on the B 10 3,535.05 barrels of oily water. In addition there were measurable quantities of cold oil remaining on both barges that totaled 3777.93 barrels. In addition there would have been immeasurable oil clinging to the internal structures of both barges. The Caddell facility is available to vessels that have to be cleaned, usually before commencing repairs at the yard. Both the B10 and B 120 were cleaned at the Caddell facility. The B 120 did not enter a floating dry dock at Caddell for repairs until May 27, 2003 and after she had been extensively washed with hot water provided by Caddell ship yard. This hot water was recycled ashore and the oil from both barges was separated and recovered to the Caddell tank cleaning facility.

Specifically, on the basis of visits we made to Caddell's facility on May 27 and May 28, 2003, we learned that the Caddell's tank cleaning facility consists of a hot water tank, two slop tanks and a slop barge, the Jaybee VI. The slop tanks and the Jaybee VI are used to hold oil residues

until they can be properly disposed of, in an environmentally acceptable manner. The hot water tank recycles the water used for cleaning and is also used to separate out the oil that is recovered from the vessels that are cleaned. Cleaning water is heated by means of oil fuel recovered during the cleaning process.

The Caddell's tank cleaning facility exists for the purpose of cleaning vessels before they are repaired or it can be used for returning dirty vessels such as the B 10 to clean oil service, (clean oil service - carrying, diesel, jet fuel and gasoline). The oil recovered at Caddell is not sold commercially so the three shore tanks are not formally calibrated however calibration tables exist for the Jaybee VI.

Appendix B Estimate of amount of oil spilled utilizing a simple hydrostatic calculation

On the basis of a simple and practical hydrostatic calculation the writer believes that approximately 21,000 gallons of oil would quickly have spilled out through the bottom of 2 starboard after the damage first occurred. The basis of this calculation is attached as Appendix B. The initial spill would have consisted of the oil in 2 starboard, that resided above the water line of the barge at the time the tank was breached.

A further quantity of oil might have leaked from the damaged location until such time as a temporary repair was made.

This additional and almost certainly much smaller leakage would have occurred because the oil loaded in the B 120's No. 2 starboard tank, on coming into contact with seawater at the ambient temperatures prevailing, might have tended to become a little heavier than the seawater that had entered the tank. It seems probable that some of the oil could then have dripped down from the interface of the seawater and warm oil remaining in 2 starboard. Much of it would stick to the undamaged bottom of the barge's tank but some of it could have fallen through the hole in the bottom. The exact way in which the oil behaved in 2 starboard tank cannot be known as it is uncertain to the writer how well the two components loaded at the Delaware River terminals had mixed. There is some possibility that the API Gravity of the mixed oil was actually lighter than 7.7. (Caleb Brett reported an API Gravity of 9.2 when the B 120 was finished her transfer to the B 10.) Whatever the actual API Gravity of the oil at the water interface the amount of oil that dropped out from the oil/water interface through the hole in 2 starboard cannot be calculated and it would be very difficult to even estimate it. However it seems quite probable that it would not be nearly as much as was initially released due to the static head of the volume of cargo that was above the water line of the barge when the damage first occurred.

It seems likely therefore that the total quantity of oil spilled, on the basis of the hydrostatic condition of the 2 starboard tank, was 21,000 gallons plus some fractional percentage of this amount. The additional amount lost is not possible to determine as it cannot be known how effectively the water that entered the bottom of the tank prevented further leakage of oil out through the hole in the bottom. The approach in establishing the quantity of the spill has to be that of working back from numbers that have a high degree of certainty.

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The writer's practical experience in handling and measuring heavy oil has more often been in non spill situations such as measuring slop oil resulting from tank cleaning, or when oil has become contaminated with water from leaking steam heating coils. From this experience the writer is able to make a good empirical estimate of the amount of oil spilled from the B 120 and calculate the maximum amount of oil that could have been spilled with a good degree of certainty. In order to make both the estimate and calculation it is necessary to review all available information. It is obviously desirable to have independent verification of the quantity and quality of the oil loaded. Fortunately this verification exists in the form of gauging reports prepared by ITS/Caleb Brett who, as independent cargo inspectors, monitored the loading and discharge for the owners of the cargo.

When oil is loaded onto ships and barges it is measured by a petroleum cargo inspection company such as ITS/Caleb Brett. These measurements are made so that the parties buying and selling the oil know what quantity of oil has been sold, purchased and delivered.

The barge crew also records amounts of cargo loaded and discharged but in making our estimate of the oil spilled we have used the documents provided by ITS/Caleb Brett, one of several independent cargo inspection companies, that are routinely retained to measure the cargo on voyages such as the one on which the B 120 experienced her accident.

We do note that ITS/Caleb Brett is one of the largest and most active petroleum cargo inspection companies and that their inspectors and laboratory staff are experienced in measuring the quantity and quality of cargoes such as the one delivered to Mirant, Sandwich by the B 120 and B 10. For this reason we feel that the ITS/Caleb Brett cargo figure reports are an appropriate basis for arriving at the conclusions expressed in this report.

However with the exception of the measurements taken at Caddell ship yard we emphasize that we did not actually witness any of ITS/Caleb Brett's measurements. (Those on the Delaware River, at Buzzards Bay or Mirant, Sandwich). Also at the time of writing this report we would expect that the oil delivered to Mirant, Sandwich was of a commercially acceptable quality and that it would have contained less than 1 percent water. We have not seen documents to support this but before a consumer will accept No. 6 fuel they normally require that the water content should not exceed 1 percent. We anticipate that tests to establish this fact were made. In the circumstances we would expect that these tests were given more attention than usual!

If additional ITS/Caleb Brett documents detailing analysis of samples taken at Mirant, Sandwich later indicate that the water content of the material discharged to Mirant, Sandwich was actually in excess of 1% then it might possibly affect the conclusions in this report.

Formal measurement of the B 120's cargo

The documents prepared by ITS/Caleb Brett are appended as attachments C through R and are described as follows and in the body of this report. The oil quantities used in our calculations are

highlighted in yellow both in the report and on the appendices. The following is an explanation of some of the terms used in the ITS/Caleb Brett reports as defined by the American Petroleum Institute (API) in their Manual of Petroleum Measurement Standards.

API - *API Gravity* (relative density) is a means used by the petroleum industry to express the density of petroleum liquids. API Gravity is measured by a hydrometer instrument having a scale graduated in degrees API. The relation between API Gravity and *relative density* (formerly called *specific gravity*) is as follows:

$$\text{API Gravity at } 60^{o}\text{F} = \frac{141.5}{\text{Relative density at } 60/60^{o}\text{F}} - 131.5$$

API Gravity is a numerical system used on petroleum and petroleum products correlated to density and relative density (see Chapter 9.1 and ASTM D 287). When an operation is performed using the International System of Units (SI), relative density will be used instead of API Gravity.

TOV - *Total observed volume* is the total measured volume of all petroleum liquids, sediment and free water, at the observed temperature.

FW - *Free water* is the volume of water present in a container that is not in suspension in the contained liquid (oil).

GOV - *Gross observed volume* is the total volume of all petroleum liquids and sediment and water, excluding free water, at the observed temperature.

GSV - *Gross standard volume* is the total volume of all petroleum liquids and sediment and water, excluding free water, corrected by the appropriate volume correction factor for the observed temperature and API Gravity, relative density, or density to a standard temperature such as 60^{o}F or 15^{o}C.

NSV - *Net standard volume* is the total volume of all petroleum liquids, excluding sediment and water and free water, corrected by the appropriate volume correction factor for the observed temperature such as 60^{o}F or 15^{o}C.

TCV - *Total calculated Volume* is the total volume of all petroleum liquids, excluding sediment and water and free water, corrected by the appropriate volume correction factor for the observed temperature such as 60^{o}F or 15^{o}C, and all free water measured at observed temperature (gross standard volume plus free water).

Water-cut measurement is the procedure of locating the oil/water interface for the purpose of determining the volume of free water in a shore tank or vessel compartment. It is also used to refer to the line of demarcation of the oil/water interface.

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Writer's notes:-

"VCF 6B" These are the factors used to correct petroleum volumes at observed temperatures to 60°F. These are obtained from ASTM D 1250-80 Table 6B.

"Ullage" The empty space in a tank to the top of the liquid in the tank. (Vessel's tanks and some shore tanks are sometimes calibrated by ullage rather than sounding or innage).

"Innage or sounding" The depth of oil in a tank

Appendix C - B 120 ITS/Caleb Brett OBQ (On Board Quantity) report. When a ship or barge routinely carries No. 6 fuel oil such as was being carried on the B 120 tanks are not cleaned between voyages. Before loading a cargo the tanks are gauged by the cargo inspectors and the On Board Quantity (OBQ) is measured. The OBQ on the B 120 was measured as 831.45 barrels of oil on April 23, before loading her first parcel of cargo at HESS Delair Terminal on the Delaware River. The B 120 is calibrated in barrels of 42 US gallons and barrel quantities can be readily converted to gallons by multiplying by 42.

Appendix D - B 120 ITS/Caleb Brett ullage report after loading at Delair. Total quantity on board after loading 42,507.59 barrels on April 23.

Appendix E - B 120 ITS/Caleb Brett ullage report before loading at Coastal Eagle Point on the Delaware River. 42,541.29 barrels on board on April 23. The small difference of 33.7 barrels is due to normal measurement inaccuracies.

Appendix F - B 120 ITS/Caleb Brett ullage report after loading at Coastal Eagle Point on the Delaware River on April 24. 95,958.69 barrels.

Appendix G - B 120 ITS/Caleb Brett ullage report before lightering to the B10 on April 28. Apparently remedial actions were taken on board to prevent leakage of oil and 2 starboard and 1 starboard tanks both contained significant and measurable quantities of oily water after these activities. The total amount of oil reported on board by ITS/Caleb Brett was measured as 93,634.26 barrels.

It is noted that all the water that ingressed into the B 120 was, as far as possible, retained on board the B 120 itself. This water would have contained significant amounts of oil because of the oil's density being close to that of water. The first parcel of the cargo that the B 120 loaded for the subject voyage was very slightly heavier than water and would not have readily separated out from the water with which it came into contact.

It should be noted that the methods that cargo inspectors use to measure heavy fuel oil cargoes become less accurate when there is a lot of water present in the material. In addition, when the temperature of the oil becomes low, water is especially difficult to detect with water finding paste or electronic water/oil interface detectors. (No. 6 fuel oil is normally carried on ships and barges at about 125 to 135 degrees Fahrenheit – the temperature is maintained by means of

heating coils). The B 120's heating system was temporarily out of service due to the damage to her 2 starboard tank. The writer is not aware at exactly which date it was recovered.

Calculation of loss based on difference in B 120 figures Eagle Point to Buzzards Bay

The amount of oil lost to the sea might be calculated as the difference between the figures in Appendix F, departure Eagle Point, and Appendix G, before part discharge to the B 10 at Buzzards Bay. This difference is 2,324.43 barrel or 97,626 gallons. We understand that at one point Bouchard Transportation gave this figure, or a number close to it, as their best estimate as to the amount of oil that could have been lost. My understanding is, that at that time, the cargo figures in Appendix F & G was the only information available to Bouchard Transportation. After reviewing all available information it can now be seen that comparing these two figures over estimated the amount of oil that was lost quite significantly.

The GSV volume figures in Appendix G were derived from measurements taken aboard the B 120 before lightering. It is noted that before the transfer at Buzzards Bay, the B 120, and then after the transfer, the B 10 as well, had both retained on board quantities of water dirtied with oil. The figures in Bouchard Transportation's "overestimate" apparently did not take account of the fact that tanks 2 starboard and 3 starboard on the B 120 contained 5,056.52 bbls of "water". This 5,056.52 barrels of material, measured by ITS/Caleb Brett as free water almost certainly contained significant quantities of oil. The oil/water liquid mixtures on board both barges, that were not discharged at Mirant, Sandwich, were later recovered by the tank cleaning facility at Caddell ship yard on Staten Island. The oil recovered at Caddell explains the cause of the inadvertent over estimate of the amount of the spill referred to above.

It is difficult to detect water in the type of oil that was being carried on the B 120, especially when the cargo has cooled; similarly it is difficult to detect the oil in the cold water that has come into contact with cargo. We understand that there were internal cargo transfer operations on board the B 120 before lightering. These first operations were for the purpose of preventing further leakage of oil into the environment and then later to consolidate the cargo that had not become contaminated with seawater. The consolidation of cargo, and separation of water, on board the B 120 and B 10 was so that the cargo could be delivered to its destination at Mirant, Sandwich.

The volumes calculated by ITS/Caleb Brett, taken before the transfer to the B 10 at Buzzards Bay, were almost certainly not as accurate as those taken later at Mirant, Sandwich. This is because at Buzzards Bay the barge was possibly moving in a sea and swell and was not on an even keel.

An additional undocumented loss of a different type of oil occurred as a result of the heating coil damage mentioned previously. As described previously the No. 6 oil cargo carried on the B 120 is heated with thermal oil heated in a boiler on board the barge and which is then passed through heating coils in the barge's tanks. When the B 120 experienced her mishap the heating coils that maintained the heat of the cargo were ruptured in 2 starboard. This meant that, as estimated by the barge crew, approximately 400 gallons of thermal heating oil were also lost to the sea or into

the cargo. For the purposes of this reconciliation we are going to assume that these 400 gallons of oil were lost to the sea.

Later, in the process of recovering the use of the cargo heating system on board, it was reported by the crew that 2,300 gallons of thermal heating oil were slopped to the B 120's cargo and this quantity is considered in our calculation in Appendix Q.

Appendix H B 120 ullage report after lightering to the B 10. ITS/Caleb Brett measurements taken at Mirant, Sandwich on April 30. 85, 818.80 barrels of oil.

Appendix I B 120 ITS/Caleb Brett ROB (Remaining on Board) report. Cargo remaining on board after discharge at Mirant, Sandwich on May 2 3,514.62 barrels

Appendix J B 10 ITS/Caleb Brett ullage report before discharge at Mirant, Sandwich on May 3 6,908.65 barrels of oil. (There is no OBQ report for the B 10 as she is a clean oil barge. However it is almost certain that her tanks or pipelines contained a few barrels of clean oil before she loaded).

Appendix K-1 B 10 ITS/Caleb Brett ROB report after discharge at Mirant, Sandwich on May 3 263.31 barrels of oil

Appendices K-2 and K-3 These are ITS/Caleb Brett's field documents left on the B10 before discharge at Mirant (a.k.a. ESCO), Sandwich. Their hand written field Ullage and ROB report show that there were also 3,535.05 barrels of slop water in tanks 3 port and 5 starboard on the B 10 both before and after discharge. (The copies of these documents in our report were faxed from the barge and ran together so the copies included in this report had to be re-copied. If needed there will almost certainly be clearer copies of these documents maintained in ITS/Caleb Brett's files at their Boston office.) This slop water on the B 10, and that on the B 120, almost certainly contained significant amounts of oil, however it was not shown on the printed copies of the ITS/Caleb Brett's report forms. Our experience is that petroleum cargo inspection companies are normally only concerned with documenting oil that meets their customer's specifications. Their interest is in documenting oil cargo that is of a commercially acceptable quality – that is, material that does not contain a lot of water. However the documents in appendices I and K do independently support the fact that there was a basis for the large amount of oil that was eventually recovered at the Caddell facility.

Appendix L Report from Caddell Dry Dock and Repair Co., Inc. dated May 23, 2003 stating that they had recovered 7,108 barrels of oil.

On May 27 we visited the Caddell yard to determine if it was feasible to verify. independently, Caddell's figures. We decided that it was feasible and advised Bouchard Transportation to engage ITS/Caleb Brett to assist us in verifying the figures that Caddell were stating as the amount of oil recovered. Our only reservation was that there were no formal calibration tables for the Caddell shore tanks and the volumes measured in these tanks had to be based on

Caddell's experience of operating the tank cleaning facility. This operating experience enabled Caddell to give the ITS/Caleb Brett Inspector and the writer an informed estimate of how many gallons there were in each tank for each foot of oil that they contained.

We felt that the recovered oil was probably somewhat higher in water content than was appreciated. However, the Caddell estimate in their letter of May 23 was in fact not greatly different from the figure that ITS/Caleb Brett measured on May 28 and that was witnessed by Independent Maritime Consulting Ltd. The documents that record the measurement of the amount of oil found at Caddell are appended as documents M through Q.

Appendix M - ITS/Caleb Brett gauging report for B 120 at Caddell on May 28. The barge was essentially clean except for 2 starboard, which required hand cleaning before repairs could be started. We witnessed ITS/Caleb Brett measure 18.86 barrels of oil in 2 starboard. This oil was deemed to be 50% water.

Appendix N - ITS/Caleb Brett gauging report for Caddell's slop recovery barge Jaybee VI.

Appendix O - ITS/Caleb Brett gauging report for three slop recovery shore tanks.

Measurement of oil recovered at the Caddell ship yard

It was surmised that the oil measured by ITS/Caleb Brett on the Jaybee VI contained significant amounts of water. For this reason, the oil was sampled from the 7 compartments on the Jaybee VI and the three Caddell shore tanks. At their Linden, New Jersey laboratory, ITS/Caleb Brett determined how much water was in the oil by putting a portion of each sample in a centrifuge and determining how much water was present. The exception was Jaybee VI tank 5 starboard which contained less water. The proportion of water present in the oil in this tank was determined by distillation of part of the representative sample. An estimated API Gravity of 12.0 was used to obtain the volume correction factors for the Caddell calculations. This is because we were told that some heavy material had settled out in the Caddell hot water tank. This settlement of heavy material in the hot water tank would have had the effect of raising the API Gravity of the other measurable material. Formal measurement of the API Gravity did not appear to be predicated as it would have entailed centrifuging large amounts of sample to remove water to obtain an API Gravity reading and would not, in the circumstances, have increased the measurement accuracy significantly.

Appendix P - This is ITS/Caleb Brett's report of analysis for water of samples taken from the Jaybee VI and the three slop recovery shore tanks.

With respect to the quantities of oil described in ITS/Caleb Brett's documents appendices N & O we subtracted the percentages of water found from the quantities of oil/water mixture measured in the Jaybee VI tanks and the three shore tanks. Our spread sheet calculation with respect to the quantities found is attached as **Appendix Q.** We calculated that the amount of oil recovered from the B 120 and B 10 at Caddell was 6,477.66 barrels. On the basis of barge figures and the appendices referred to above it is possible to calculate the amount of oil lost in three different

ways. These are defined as reconciliation methods 1, 2 & 3 and are as described below. The two decimal points of accuracy with respect to the Caddell figures are not actually warranted due to the other inaccuracies mentioned but it is customary to calculate barrel quantities to two decimal places so we have maintained this convention.

Reconciliation method 1

B120 on board at Mirant, Sandwich before discharge	85,818.80 barrels of oil
B120 on board at Mirant, Sandwich after discharge	3,514.62 barrels of oil

Subtracting the after discharge figure from the before discharge figure gives a barge discharged figure for the B120 of A)

A) B120 discharged at Mirant, Sandwich	82,304.18 barrels of oil

B10 on board at Mirant, Sandwich before discharge	6,908.65 barrels of oil
B10 on board at Mirant, Sandwich after discharge	263.31 barrels of oil

Subtracting the after discharge figure from the before discharge figure gives a barge discharged figure for the B10 of B)

B) B 10 discharged at Mirant, Sandwich	6,645.34 barrels of oil

Total delivered to Mirant, Sandwich barge figures (A+B)	88,949.52 barrels of oil

C) Total oil recovered at Caddell	6,477.66 barrels of oil

sum of A) B) and C)	95,427.18 barrels of oil
B 120 on board sailing from Eagle Point	95,958.69 barrels of oil

Difference	531.51 barrels of oil

This barrel quantity difference is equivalent to 22,323 gallons of oil and this difference, between the total amounts recovered and the B 120 figures sailing from Eagle Point, is obviously due to the oil that leaked from the B 120. This figure is remarkably close to the hydrostatic calculation that we performed in Appendix B and may be an indication that not much oil leaked from the barge after the initial release. We note that doubt with respect to the figure really being this low might be raised because the B 120 was recorded as having on board 3,514.62 barrels of oil on board on leaving Mirant, Sandwich yet 6,477.66 barrels of oil were recovered at Caddell. This difference in recovery figures can be largely accounted for as follows:

In addition to the 3,514.62 barrels of ROB oil on the B 120 the B 10 had an ROB of 263.61 barrels of oil on completion of discharge at Mirant, Sandwich. After discharge at Mirant, Sandwich the B 120 also had on board 1,759.65 barrels of free water. The B 10 had on board 3,535.05 barrels of free water. Due to the similarity in API Gravity of the oil and water this free

water almost certainly contained considerable quantities of oil and might be more properly described as oily water. Additionally on both barges there were certainly quantities of immeasurable clingage (oil stuck to the sides of the barge and its internal stiffening structures). This clingage would be considerable on the B 120 as she was permanently in heavy oil service and her cargo heating system was out of service for some time as a result of the accident.

As explained in our discussion of Appendix B some unknown quantity of oil could have leaked out of the barge after the first initial release. In order to establish how much oil might have leaked it is desirable to compare the shore tank figures for what was loaded onto the barge at the load port, to the shore tank figures of what was received from the barge at the discharge port(s). In this case Mirant, Sandwich and Caddell's ship yard on Staten Island. Unfortunately shore tank figures for the loading at Eagle Point are not available. This is because the B 120 loaded from an active shore tank. "Active shore tank" means that refinery production units were feeding the shore tank while it was being used to load the B 120.

In light of this problem we have done the next best thing and compared the B 120 figures on sailing with the figures received at Mirant, Sandwich **(see Appendix R)** and the oil recovered at Caddell. However, due to the lack of shore tank calibration tables the accuracy of the figures at Caddell is uncertain so the following reconciliation (method 2) may not be any more accurate than reconciliation method 1.

Reconciliation method 2

From Appendix R

Oil received ashore at Mirant, Sandwich ex B 120	81,998.06 barrels of oil
Oil received ashore at Mirant, Sandwich ex B 10	6,241.40 barrels of oil
Oil recovered/received at Caddell (appendix Q)	6.477.66 barrels of oil
Total received ashore	94,717.12 barrels of oil
B 120 on board sailing from Eagle Point	95,958.69 barrels of oil
Difference	1,241.57 barrels of oil

The barrel quantity is equivalent to 52,146 gallons of oil.

A third method of reconciliation is also available – essentially it is a refinement of reconciliation method 2.

Reconciliation method 3

We note on Appendix F that ITS/Caleb Brett recorded that the barge B 120 has a VEF (Vessel experience factor). Ship and barge calibrations are often not as accurate as shore tank calibrations. For this reason cargo inspection companies such as ITS/Caleb Brett develop loading and discharge histories for ships and barges so that when they, load from, or discharge to

active shore tanks, more accurate cargo figures are available than simply using the vessel figures as derived from the vessel's calibration tables.

ITS/Caleb Brett have recorded a VEF for the B 120 of 1.0047 on Appendix F.

The VEF is a divisor so the B 120 had on board slightly less than was stated by the quantity of 95,958.69 barrels recorded in Appendix F and as calculated from her calibration tables without the VEF applied.

If we divide the figure of 95.958.69 barrels (quantity on board sailing from Eagle Point) by the VEF of 1.0047 we arrive at a figure of 95,509.79 barrels as the amount of cargo on board departing from Eagle Point. When the figure for cargo landed at Mirant, Sandwich and Caddell of 94,717.12 barrels is subtracted this gives a figure of 792.67 barrels of oil lost or 33,292 gallons. At this time we are not party to how the VEF for the B 120 was calculated and how accurate it is. The fact that the VEF is somewhere in the region of 1.0047 is a strong indicator that the amount of oil lost was actually substantially less than the amount of 52,146 gallons indicated in reconciliation 2.

In truth there are bound to be inaccuracies in the measurements at all stages of the movement and transfer of the B 120's cargo and the figure for the quantity of oil lost can never be known exactly.

However on the basis of our study of the available information and our participation in the measurement of the recovered oil at Caddell we feel confident in saying that the amount of oil lost was certainly not less than 22,000 gallons. That it was most unlikely to have been more than 55,000 gallons and there is a good probability that it was not more than and approximately the mean of these last two figures or close to 39,000 gallons. The figure of 39,000 gallons is slightly less than one percent of the cargo originally on board when the barge departed the Delaware River. The second figure released by Bouchard Transportation, that of 98,000 gallons of oil lost, was a reasonable estimate based on the best information available at the time but now appears to have been a significant over estimate.

This report is issued, discussions and meetings held, all without prejudice to any party.

June 14, 2003

Independent Maritime Consulting Ltd

David A. Hall, Marine Surveyor & Consultant
Member of the Nautical Institute
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