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Comparison of common dredging equipment air emissions

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A COMPARISON OF
COMMON DREDGING EQUIPMENT AIR EMISSIONS

By

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A THESIS

Submitted in partial fulfillment of the requirements

for the degree of

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THIS THESIS, "A COMPARISON OF COMMON DREDGING EQUIPMENT AIR EMISSIONS," IS HEREBY APPROVED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN CIVIL ENGINEERING.

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ABSTRACT

The purpose of this study is to provide a procedure to include emissions to the atmosphere resulting from the combustion of diesel fuel during dredging operations into the decision-making process of dredging equipment selection. The proposed procedure is demonstrated for typical dredging methods and data from the Illinois Waterway as performed by the U.S. Army Corps of Engineers, Rock Island District. The equipment included in this study is a 16-inch cutterhead pipeline dredge and a mechanical bucket dredge used during the 2005 dredging season on the Illinois Waterway.

Considerable effort has been put forth to identify and reduce environmental impacts from dredging operations. Though environmental impacts of dredging have been studied no efforts have been applied to the evaluation of air emissions from comparable types of dredging equipment, as in this study. By identifying the type of dredging equipment with the lowest air emissions, when cost, site conditions, and equipment availability are comparable, adverse environmental impacts can be minimized without compromising the dredging project

A total of 48 scenarios were developed by varying the dredged material quantity, transport distance, and production rates. This produced an "envelope" of results applicable to a broad range of site conditions.

Total diesel fuel consumed was calculated using standard cost estimating practices as defined in the U.S. Army Corps of Engineers Construction Equipment Ownership and Operating Expense Schedule (USACE, 2005). The diesel fuel usage was estimated for all equipment used to mobilize and/or operate each dredging crew for every scenario.

A Limited Life Cycle Assessment (LCA) was used to estimate the air emissions from two comparable dredging operations utilizing SimaPro LCA software. An Environmental Impact Single Score (EISS) was the SimaPro output selected for comparison with the cost per CY of dredging, potential production rates, and transport distances to identify possible decision points.

The total dredging time was estimated for each dredging crew and scenario. An average hourly cost for both dredging crews was calculated based on Rock Island District 2005 dredging season records (Graham 2007/08).

The results from this study confirm commonly used rules of thumb in the dredging industry by indicating that mechanical bucket dredges are better suited for long transport distances and have lower air emissions and cost per CY for smaller quantities of dredged material. In addition, the results show that a cutterhead pipeline dredge would be preferable for moderate and large volumes of dredged material when no additional booster pumps are required. Finally, the results indicate that production rates can be a significant factor when evaluating the air emissions from comparable dredging equipment.

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CHAPTER 1: INTRODUCTION AND BACKGROUND

1.1 Importance of Dredging

Dredging is the underwater excavation of accumulated sediments. The removal of sediment from a water body can be done for several reasons. The primary purposes are: navigation, mining, ecosystem restoration, and the removal of contaminants. Once sediment has been removed from the channel it is referred to as dredged material. In fiscal year (FY) 2006 the U. S. Army Corps of Engineers (USACE) dredged a total of 204.2 million cubic yards (CY) of sediment (NDC 2007). Navigation maintenance dredging accounted for 137.8 million CY or 67.5% of this total. Two types of dredging equipment performed 66.6% of the total dredging completed in FY 2006. Cutterhead pipeline dredges removed 118.6 million CY of material or 58.1% and mechanical dredges removed 17.4 million CY or 8.5% of the total material dredged in 2006.

Navigation maintenance dredging is an integral and necessary operational component of our waterborne transportation system. Waterborne commerce in the United States totaled 2,588 million short tons in 2006 (IWR 2006). Of that total 702.1 million short tons were transported within the Mississippi River System with 490.6 million short tons being classified as internal traffic. Internal traffic is defined as "vessel movements (origin and destination) which take place solely on inland waterways. An inland waterway is one geographically located within the boundaries of the contiguous 48 states or within the boundaries of the State of Alaska" (IWR 2006). Nearly 25% or 120.4 million short tons of the Mississippi River System internal traffic were transported on the Illinois Waterway. The waterborne transportation system would be crippled if navigation maintenance dredging was not performed in a regular and timely manor.

1.2 Types of Dredges

There are numerous types of dredges used for the various purposes including: cutterhead pipeline (CPD), mechanical bucket or clamshell (MBD), hopper, sidecaster, and dustpan dredges. Each type of dredge is well suited for different site conditions (both dredge cut and placement site), sediment characteristics, quantities of sediment to be dredged, production rates, and distance that the material must be transported to a placement site (USACE 1983).

1.2.1 *Cutterhead Pipeline Dredges*

Cutterhead pipeline dredges have an arm or ladder with a rotating cutterhead located at the intake end of the dredge (Figure 1.1). This ladder is lowered down to the channel bottom where the cutterhead dislodges the sediment and a pump transports the dredged material and water slurry through a discharge pipeline to the placement site. The slurry is approximately 10% to 20% dredged material and 80% to 90% water. The placement site must be designed to contain the dredged material slurry long enough for the sediment to settle out and have a gravity feed or pump to return the excess water to the channel. Cutterhead pipeline dredges are available in a wide range of sizes, designated by the diameter of the discharge pipe that can vary from 8 inches up to 36 inches or more and are the most commonly used dredge type in the United States (USACE 1983).

Cutterhead pipeline dredges are capable of excavating most types of sediment including: clay, silt, sand, and gravel, large dredges are even able to excavate some corals and softer rock formations. Production can be done on an almost continuous basis resulting in economical and efficient operations for larger volumes of dredged material. Cutterhead pipeline dredges are not well suited for work in open-water without encountering operational and safety problems cause by high waves. Also, the discharge pipeline can potentially interfere with navigation. In order to minimize any negative effects to navigation, the dredge will need to stop production and move the dredge, discharge pipeline, or both out of the navigation channel. Additionally, debris and obstructions will tend to clog or damage the rotating cutterhead and should be avoided whenever possible (USACE 1983).

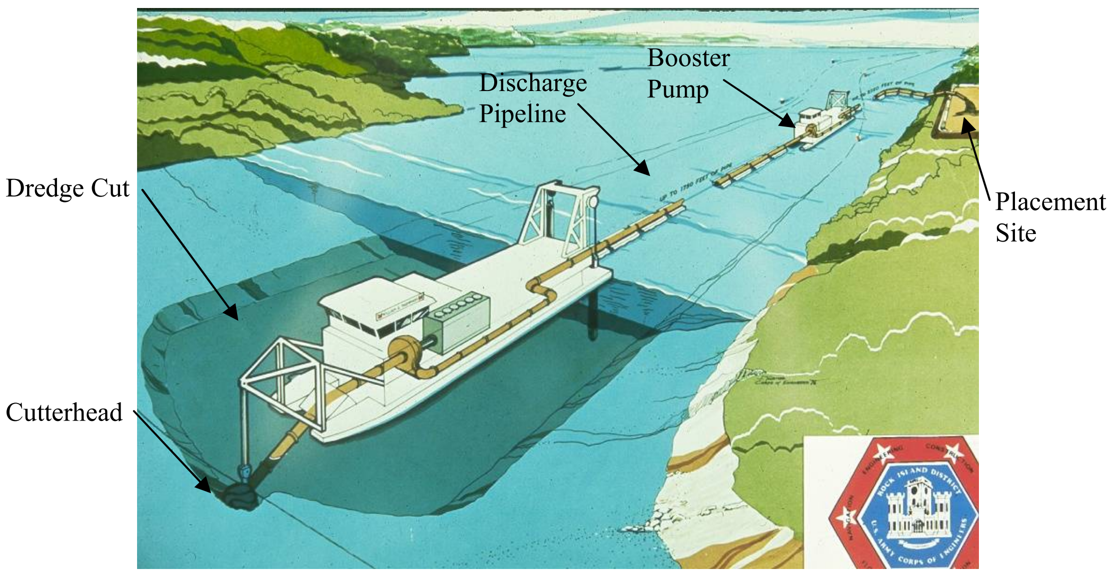

Figure 1.1: Cutterhead Pipeline Dredge

(Figure courtesy of U. S. Army Corps of Engineers, Rock Island District [Date Unknown] Unpublished Figure) (Documentation can be found in Appendix E)

1.2.2 *Mechanical Bucket Dredges*

A mechanical bucket or clamshell dredge uses a crane or an excavator similar to excavators used in the construction and/or mining industries to mechanically scoop the sediment from the channel bottom and place it on a barge for transport to the placement site (Figure 1.2). Different types of buckets, such as clamshell, excavator, or dragline, can be used depending on the dredging requirements. This type of dredge is very durable and capable of removing most types of sediment including: clay, sand, gravel, and blasted rock but is inefficient for the removal of soft fine-grained sediment. Mechanical bucket dredges are capable of removing most debris and obstruction making them well suited for debris laden dredge cuts. Dredged material is transported to placement sites on barges limiting production rates relative to cutterhead pipeline dredges and making mechanical bucket dredges well suited for long transport distances (USACE 1983).

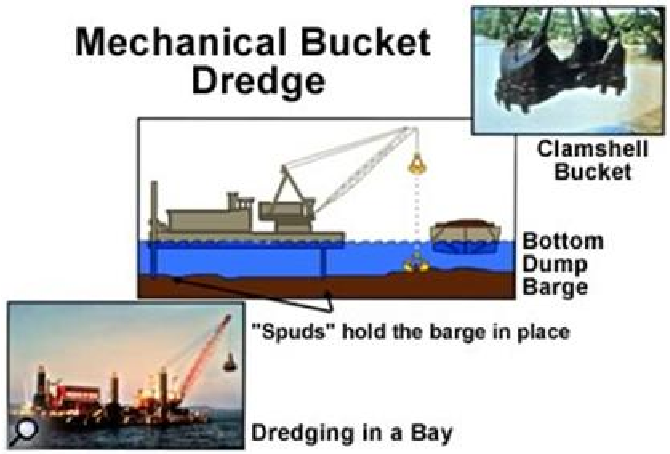

Figure 1.2: Mechanical Bucket or Clamshell Dredge
(USACE 2008)(Documentation can be found in Appendix E)

1.2.3 *Hopper Dredges*

Hopper dredges are self-propelled seagoing vessels making them ideally suited for open-water and high traffic areas (Figure 1.3). These dredges are capable of removing sediment from the navigation channel without interfering with traffic, are maneuverable, and well suited for open-water or ocean placement of dredged material. They operate by lowering a suction head on a drag arm and pumping sediment into a hopper within the vessel hull. The dredge then travels to the placement site and empties the hopper either through an opening in the bottom of the hopper or by pumping the dredged material to an upland placement site. Hopper dredges are deep draft vessels that are not capable of operations in shallow waters, near structures, or when precise control on the dredge cut is required. Hopper dredges are best suited for removal of loose, unconsolidated sediment. Since the same vessel dredges and transports the dredged material, dredging operations cannot be done on a continuous basis, limiting overall production rates (USACE 1983).

1.2.4 *Sidecaster Dredges*

Sidecaster dredges are a shallow draft seagoing vessel specifically designed for remote open water areas (Figure 1.4). These dredges are typically self-sustaining and can operate with minimal support requirements. Sediment is pumped from the channel through a suction head on a drag arm and discharged overboard through a suspended discharge pipeline. These dredges are designed to be easily and rapidly deployed and to initiate dredging immediately upon arrival at the dredge cut. Sidecaster dredges require adequate water depth to reach the dredge cut and may be limited to dredging only during high tides. Open water disposal of the dredged material is the only disposal capability for sidecaster dredges. Because the discharge is relatively close to the dredge, some material may migrate back into the navigation channel due to tidal and littoral currents (USACE 1983)

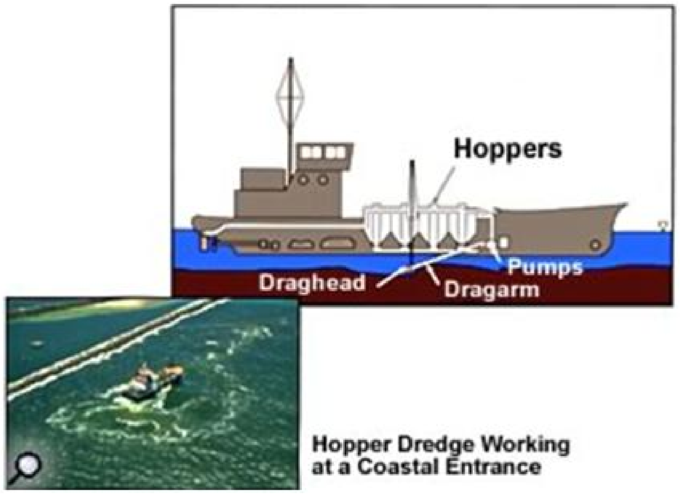

Figure 1.3: Hopper Dredge
(USACE 2008) (Documentation can be found in Appendix E)

Figure 1.4: Sidecaster Dredge
(USACE 2008) (Documentation can be found in Appendix E)

1.2.5 *Dustpan Dredges*

Dustpan dredges were designed to remove primarily sand and gravel from shallow locations making them unsuitable for open or rough water locations. These dredges utilize water jets located in a dustpan head to dislodge sediments which are pumped through a pipeline and discharged into open water outside the navigation channel (Figure 1.5). Typically, the discharge is only 800 to 1,000 feet from the dredge and is not designed for long transport distances or upland placement sites. Dustpan dredges are capable of rapid mobilization, high production rates, and can easily move out of the navigation channel to avoid unwanted commercial vessel delays (USACE 1983).

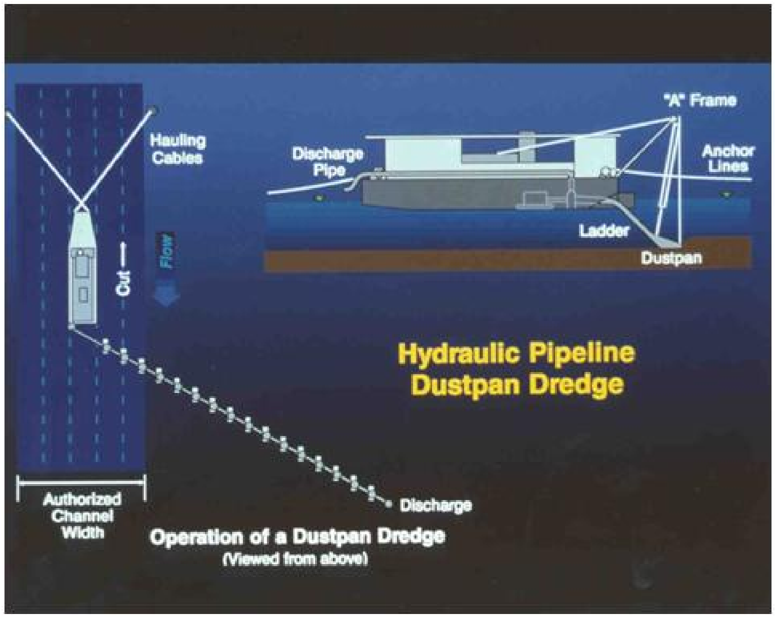

Figure 1.5: Dustpan Dredge
(USACE 2006) (Documentation can be found in Appendix E)

1.3 Comparison of Dredging Methods

The type of equipment included in this analysis will be limited to that which is commonly used for navigation channel maintenance dredging on the Illinois Waterway (IWW) and Upper Mississippi River (UMR) within the U. S. Army Corps of Engineers, Rock Island District. The equipment selected was used by Rock Island District for navigation channel maintenance dredging on the IWW during the 2005 dredging season (Table 1.1). It included a 16-inch cutterhead pipeline dredge owned and operated by an independent contractor and a mechanical bucket dredge owned and operated by Rock Island District (Graham 2007/08).

Cutterhead pipeline dredges are capable of pumping dredged material approximately 5,000 to 12,000 feet with just the pump on the dredge itself, depending on the size dredge, elevation change to the placement site, and sediment characteristics. In order to transport dredged material over longer distances, additional inline booster pumps must be added (Figure 1.1). Typically, only two booster pumps can be efficiently added to the dredging process, increasing the transport distance by 1,000 to 3,000 feet per booster pump. If the distance between the dredge cut and placement site exceeds the total distance with booster pumps then an intermediate placement site within the water body must be identified and approved. The sediment would be dredged to this intermediate placement site then the dredge would be moved from the original dredge cut to the intermediate placement site and the material would be dredged a second time and transported to the final placement site, commonly referred to as re-handling or double handling the dredged material. This process significantly increases the environmental impacts and the cost per CY which usually makes a cutterhead pipeline dredge unsuitable for dredging and transporting dredged material distances greater than that reachable with two booster pumps. The transport distances for the 16-inch contractor-owned dredge used by Rock Island District for the 2005 dredging season are 8,000 feet for the dredge alone, with each booster pump capable of increasing the transport distance by 2,000 feet. Once a cutterhead pipeline dredge has been mobilized and set up at a dredge cut it is capable of nearly continuous dredging with few interruptions except for routine maintenance for the equipment, movement of the discharge pipeline to minimize delays to navigation, and relocation of the pipeline within one or to another placement site. This results in relatively high production rates. Cutterhead pipeline dredges generate a considerable quantity of water that must be managed at the placement site (Figure 1.6) to meet water quality standards.

Table 1.1: Equipment Included in this Study

Mechanical Bucket Dredge		Cutterhead Pipeline Dredge	
Equipment	**Quantity**	**Equipment**	**Quantity**
Excavator	1	Main Engine	1
M/V LaSalle	2	Cutter Head Engine	1
Gen Set (LaSalle)	1	Booster Pumps	2
Dozer (D6T)	1	Spud Hyd Drive Engine	1
Dozer (950G)	1	Gen Set (Dredge-300kW)	1
Gen Set (Crane Barge)	2	Gen Set (Dredge-35kW)	1
		Tender (Max)	1
		Tender (Scotty)	1
		Tender (Debra Ann) (Mob Only)	1
		Tractor	1
		Tractor	1
		Crissafully Pump	1
		Anchor Barge	3
		Crane	1
		Light Plants	2

Mechanical bucket dredges are well suited when the dredge material must be transported distances greater than 12,000 feet. Once the material has been dredged and loaded onto a barge it can be transported long distances without requiring re-handling. Another situation where mechanical bucket dredges are well suited is for small quantities of material to be dredged from one location, because they are relatively quick and inexpensive, compared to cutterhead pipeline dredges, to mobilize and demobilize. Another consideration for dredging equipment is the distance from the river channel to the placement site. Either an excavator or a dozer would be used to transfer the dredged material from the barge to the placement site as long as the site is adjacent to the river channel. If the placement site is not immediately adjacent to the channel, material dredged by a mechanical bucket dredge would need to be transferred from the barge to a truck for transport overland to the placement site. This would add expense, negative environmental impacts, and reduce production rates over a cutterhead pipeline dredge. A cutterhead pipeline dredge could extend the discharge pipeline over land to the placement site as long as the total transport distance doesn't exceed the maximum distance for that dredge.

Figure 1.6: Cutterhead Pipeline Dredge Discharge
(Figure courtesy of U. S. Army Corps of Engineers, Rock Island District [Date Unknown] Unpublished Photograph) (Documentation can be found in Appendix E)

Each type of dredge has distinct advantages and disadvantages that contribute to the decision-making process (Tables 1.2 and 1.3) (USACE 1983). Mechanical bucket dredges are quicker and more economical to mobilize, are capable of transporting dredged material over long distances, require less supporting equipment, and have relatively low production rates. Cutterhead pipeline dredges are more difficult and costly to mobilize, are limited in the distance they can transport dredged material, require more support equipment, and have relatively high production rates. In general terms this means that mechanical bucket dredges are better suited to small quantities of material to be dredged at a given location and/or long (greater than 12,000 feet) transport distances while cutterhead pipeline dredges are better suited to large quantities and shorter transport distances (less than 12,000 feet).

Typically, dredging decision makers utilize multiple criteria for selection of dredging equipment and placement site for each dredge cut(s) (Table 1.4) (USACE 2003-A). These criteria are used to identify and implement the most suitable combination of equipment and placement site(s) for navigation channel maintenance dredging over a 20 to 40 year planning horizon.

Table 1.2: Mechanical Bucket Dredge

Advantages	Disadvantages
Rugged and reliable	Lower production rates
Capable of removing hard packed material	Difficult to retain fine/loose sediment with conventional bucket
Able to work in relatively tight areas	Inefficient for short transport distances
Efficient for long transport distances	Additional controls required for contaminated sediment
Relatively low mobilization/demobilization costs	
Has ability to remove debris	
Return water not an issue	

Table 1.3: Cutterhead Pipeline Dredge

Advantages	Disadvantages
Capable of dredging most types of sediment	Cohesive material and debris can block cutterhead
Capable of pumping dredged material directly to placement site	Dredging slurry is 80% to 90% water and 10% to 20% sediment
Higher production rates	Debris may reduce efficiency
Cost effective for large volumes of dredged material	Return water management must be incorporated into design
Cost effective within pumping distance of placement site	Relatively high mobilization costs
Readily available in wide range of sizes	Pipeline may obstruct navigation

Table 1.4: Dredging Decision Making Criteria

Volume of material to be dredged	Width and depth of dredge cut
Type of material to be dredged	Access to the dredge cut
Distance to placement site	Potential beneficial use applications
Access to the placement site	Potential for debris within dredge cut
Production rates for various types of equipment	Required time frame for dredged material consolidation
Return water management	Dredging equipment availability
National Environmental Policy Act (NEPA) Compliance	

1.4 Dredged Material Placement Sites

Dredged material placement sites used in Rock Island District fall into five broad categories including: thalweg, bankline, near shore, upland, and confined. The thalweg is the deepest part of a river channel cross section which usually has the highest flow rates. A bankline placement site would be within the flood plane and immediately adjacent to the river channel. Beach nourishment would be one example of a bankline placement site (Figure 1.7). Near shore placement sites would also be located within the flood plane but further away from the river channel than a bankline placement site. Upland placement sites are located outside of the flood plane, frequently behind a levee (Figure 1.9). Confined disposal placement sites are engineered facilities that contain dredged material within a specified footprint (Figure 1.11).

1.4.1 *Thalweg Dredged Material Placement Sites*

Thalweg placement of dredged material could be done using either a cutterhead pipeline or mechanical bucket dredge. The site would be located in a reach of river that is particularly deep, usually 20 to 30 feet in depth or more, this compares to the navigation channel mandated minimum depth of nine feet. Not all reaches of the UMR or IWW have thalweg conditions that are suitable for dredged material placement. This is not a particularly desirable option since it does not remove the sediment from the river channel and could result in additional environmental impacts. There are some advantages to thalweg placement that must be taken into account before eliminating this type of placement site from consideration. Thalweg placement is economical as long as the distance between the dredge cut and placement site are within the dredges transport distance capabilities. Also, there is no return water to manage when using a cutterhead pipeline dredge.

1.4.2 *Bankline Dredged Material Placement Sites*

Bankline placement could be done using either a cutterhead pipeline or mechanical bucket dredge. The dredged material is placed on the river shore or bankline (Figure 1.7) for habitat restoration, beach replenishment or nourishment, or erosion protection. A bankline placement site for habitat restoration could be to stabilize tree root systems that have been exposed due to erosion, increase the land surface elevation in areas to provide safe havens for wildlife to use during flood events (Figure 1.8), and create or enhance islands. Recreational facilities along the river are highly desirable to state and local governments along with the public. Dredged material can be used to nourish beaches and enhance the recreational experiences for boaters and swimmers. On occasion dredged material can be placed on banklines for erosion protection of cultural and historic sites that are not easily accessible for more traditional erosion protection systems such as riprap. In addition, dredged material can be used as short-term erosion protection or as fill to restore a bankline in preparation for riprap or some other erosion protection system.

Figure 1.7: Bankline Placement
(Figure courtesy of U. S. Army Corps of Engineers, Rock Island District [Date Unknown] Unpublished Photograph) (Documentation can be found in Appendix E)

Figure 1.8: Island Mound and Swale Placement
(Figure courtesy of U. S. Army Corps of Engineers, Rock Island District [Date Unknown] Unpublished Photograph) (Documentation can be found in Appendix E)

1.4.3 *Near Shore Dredged Material Placement Sites*

Near shore placement sites would include those sites that are within the floodplain but beyond the bankline. These placement sites can be used for habitat restoration similar to bankline sites or as long-term placement sites. The preferential option for long-term placement sites is typically to locate them outside of the floodplain to avoid adverse impacts to flood water surface elevations and the risk of re-suspension of the sediment and transport back into the river channel during high water events. However there are locations where the floodplain extends beyond practical and economical limits of transporting dredged material so near shore sites must be considered.

1.4.4 *Upland Dredged Material Placement Sites*

Upland sites are located outside the floodplain and are typically the preference of resource and regulatory agencies since they will have no impact on flood water surface elevations and they eliminate the potential for transport back into the river channel during floods. Upland sites could include: placement on the landside of levees (as long as the level of flood protection is not increased) (Figure 1.9); placement on existing agricultural fields; beneficial use stockpiles; and for habitat restoration.

Figure 1.9: Behind Levee Placement
(Figure courtesy of U. S. Army Corps of Engineers, Rock Island District [Date Unknown] Unpublished Photograph) (Documentation can be found in Appendix E)

1.4.5 *Confined Dredged Material Placement Sites*

Confined dredged material placement facilities (CDF) are engineered and constructed sites that will retain the dredged material within a specified footprint. CDFs can be used for island creation (Figure 1.10), long-term dredged material placement sites (Figure 1.11), commercial and recreational site development, and for contaminated dredged material to ensure contaminates do not migrate off-site.

Figure 1.10: UMR Island Creation

(Figure courtesy of U. S. Army Corps of Engineers, Rock Island District [Date Unknown] Unpublished Photograph) (Documentation can be found in Appendix E)

Figure 1.11: UMR Pool 11 CDF

(Figure courtesy of U. S. Army Corps of Engineers, Rock Island District [Date Unknown] Unpublished Photograph) (Documentation can be found in Appendix E)

1.5 Dredging Equipment Emissions to the Atmosphere

Navigation channel maintenance dredging equipment used on the IWW and UMR, as with most locations, needs to be mobile and capable of operation without an external power source, making diesel fuel the predominate choice. All of the equipment included in this study is diesel powered (Table 1.1). The combustion of diesel fuel releases pollutants into the atmosphere that can be quantified and compared between dredging crews to determine the lowest adverse environmental impacts for each type of equipment and scenario. Common pollutants found in emissions from diesel fuel combustion in industrial equipment are listed in Table 1.5 (NREL, 2003). These contaminants impact air quality and may add to global climate change considerations.

Table 1.5: Pollutants Included in this Study (NERL 2003)

Acectaldehyde	Formaldehyde	Propene
Acrolein	Methane	Toluene
Benzene	Nitric Oxide	Sulfur oxides
Butadiene	Nitrogen oxide	VOC (unspecified)
Carbon dioxide (fossil)	PAH, polycyclic aromatic hydrocarbons	Xylenes
Carbon monoxide	Particulates (PM10)	

1.6 Purpose of Present Study

The purpose of this paper is to provide a procedure to incorporate air emission impacts into the decision-making process for dredging equipment selection. The proposed procedure is demonstrated for typical dredging methods and other data from the Illinois Waterways as performed by the U.S. Army Corps of Engineers, Rock Island District. In this process, emissions to the atmosphere resulting from the combustion of diesel fuel in comparable types of dredging equipment were evaluated. A total of 48 scenarios were developed by varying quantity of material dredged, transport distance, and production rate. Air emissions were calculated for each type of dredging equipment and scenario using SimaPro Life Cycle Assessment (LCA) software. SimaPro characterizes each constituent into one or more impact categories (Tables 3.7 and 3.8). Each impact category was multiplied by weighting factors in SimaPro yielding common units that can be totaled to provide an Environmental Impact Single Score (EISS). See Chapter 3 for a detailed explanation if the limited LCA procedure and eco-efficiency analysis. Total cost for each scenario analyzed was estimated and normalized on a per CY basis for ease in comparison with the EISS across multiple scenarios. The results will provide a tool to help dredging decision-makers select equipment that will reduce air emissions at a comparable cost per CY, thus improving the sustainability of navigation channel maintenance dredging.

CHAPTER 2: LITERATURE REVIEW

The U.S. Army Corps of Engineers (USACE) was first tasked with maintaining and improving a waterborne navigations system in 1824. Deepening and clearing out rivers and harbors was added to the USACE responsibilities in 1826 (USACE 2007) and remains an integral part of the USACE mission. Typical types of equipment and placement sites utilized for navigation channel maintenance dredging are outlined in Sections 1.2 and 1.4 respectively. USACE, both independently and in collaboration with the U. S. Environmental Protection Agency (USEPA), have developed several manuals for dredging operations, including dredged material placement sites, and environmental impacts from dredging (Table 2.1).

Even though navigation maintenance dredging has been done for hundreds of years the environmental effects are fairly recent considerations. Environmental impacts of dredging have been studied and documented with most of the information having been developed over the past 10 to 15 years (Bridges 2008). The areas of primary focus have been the identification and implementation of beneficial uses for dredged material, environmental dredging, emissions to air from the placement and/or re-suspension of contaminated dredged material, and the regulation of emissions to the air from marine engines. Though environmental impacts of dredging have been studied, no efforts have been applied to the evaluation of air emissions from comparable types of dredging equipment, as in this study.

2.1 Beneficial Use of Dredged Material

Beneficial use of dredged material is defined as "utilizing dredged sediments as resource materials in productive ways" (DOTS 2006). Dredged material may be utilized as construction materials, aquaculture, topsoil, beach nourishment, berm creation, capping, land creation, land improvement, fill, shore erosion protection, habitat enhancement, and wetland restoration (DOTS 2006).

The Great Lakes Commission, responding to the findings of the Great Lakes Beneficial Use Task Force, has identified the beneficial use of dredged material as a "priority management option" and has adopted a resolution for increasing federal funding, research, and USACE authority for beneficial use (Pebbles 2002). The emphasis on identifying and implementing beneficial uses for Great Lakes dredged material will help to minimize environmental impacts from dredging but does not address the air emissions from dredging equipment.

The loss of Louisiana coastal wetlands is being addressed through the beneficial use of dredged material. USACE, New Orleans District has utilized approximately 27 million CY of the 90 million CY of sediment dredged from federal navigation channels for coastal wetlands restoration projects. This has resulted in the restoration of approximately 10,000 acres of wetlands (Creef and Mathies 2002).

The Illinois River, a major segment of the Illinois Waterway, is part of a large flyway for North American migratory birds. Extensive sedimentation in the backwaters has severely degraded this habitat. The restoration of this migratory flyway will require the removal and placement of a considerable volume of sediment (Marlin and Darmody

2002). Beneficial use applications for this dredged material are being investigated including: island creation and enhancement, topsoil, fill, and urban renewal (Marlin and Darmody 2002).

USACE, Rock Island District has been actively involved in identifying and implementing beneficial uses for navigation channel maintenance dredged material. Examples of beneficial uses for dredged material from the IWW and UMR are levee repair (Figure 2.1), island creation (Figure 1.10), fill/construction materials (Figure 2.2), beach nourishment (Figure 2.3), and habitat enhancement (Figure 1.8 and 2.4).

Figure 2.1: Levee Repair, Green Island Levee District

(Figure Courtesy of U. S. Army Corps of Engineers, Rock Island District [Date Unknown] Unpublished Photograph) (Documentation can be found in Appendix E)

Figure 2.2: Fill/Construction Materials, Pool 16 UMR
(Figure courtesy of U. S. Army Corps of Engineers, Rock Island District [Date Unknown] Unpublished Photograph) (Documentation can be found in Appendix E)

Figure 2.3: Beach Nourishment
(Figure courtesy of U. S. Army Corps of Engineers, Rock Island District [Date Unknown] Unpublished Photograph) (Documentation can be found in Appendix E)

Figure 2.4: Habitat Restoration, Potters Marsh
(Figure courtesy of U. S. Army Corps of Engineers, Rock Island District [Date Unknown] Unpublished Photograph) (Documentation can be found in Appendix E)

2.2 Environmental Dredging

Environmental dredging can be defined as “dredging performed specifically for the removal of contaminated sediments for the purpose of remediating environmental risks” (USCAE 2008-B). An environmental dredging workshop sponsored by the U.S. Army Corps of Engineers (USACE) and U.S. Environmental Protection Agency (USEPA) focused on re-suspension of sediments, release of contaminants from in-situ and suspended sediments, residual contaminated sediments, and environmental risks (Bridges 2008). None of these focus areas included the air emissions from dredging operations.

According to W. D. Rokosch and N. J. Berg, selection of the best dredging technique for a particular project should be based on several criteria including: dredging location conditions such as water depth, extent of dredge cut, navigation, structural obstructions, sediment characteristics, potential for debris, and underwater structures; environmental regulations; cost considerations; and the positive and negative effects of the dredging operations (Rokosch and Berg 2002). None of the considerations for selection of dredging techniques are air emissions from the dredging equipment.

Several stakeholders from four European countries, France, the United Kingdom, Belgium, and the Netherlands, developed New!Delta, a project to promote the sustainable development of ports and port related activities. One of New!Delta’s strategies is sustainable dredging defined as “a strategy in which management of dredging operations is a part of an integrated estuary management that strikes a balance between environmental, economic, social and technical aspects while respecting the legal requirements” (NEW!Delta 2007). The focus of their sustainable dredging strategy is on the potential changes to the physical and sedimentary processes, ecology and habitats, and the existing and future use of the estuary. The primary effects of dredging and dredged material disposal, as outlined in their report, include changes to the hydromorphology, loss of habitat, sedimentation, suspended sediment and turbidity, dispersion of contaminated sediment, reduction in oxygen levels, and disturbances such as noise, light, and movement (New!Delta 2007). Again, there is no consideration for the air emissions from the dredging equipment included in their sustainable dredging strategy.

A rating system similar to that used with Leadership in Energy and Environmental Design (LEED) could be utilized to promote sustainable port development and operation (Abood 2007). The LEED system includes the following six categories: “1.) sustainable sites, 2.) water efficiency, 3.) energy and atmosphere, 4.) materials and resources, 5.) indoor environmental quality, and 6.) innovation and design process”. A total of 69 points can be awarded within these categories. According to Abood LEED Categories 4, Materials and Resources, and 6, Innovation, would be the primary sources for dredging and dredged material placement to achieve points (Abood 2007). These points could be received for beneficial use of dredged material, enhancement of aquatic life, and minimizing the loss of habitat. In addition, LEED Categories 2, Water Efficiency, and 5, Indoor Environmental Quality could achieve points for dredged material treatment and reductions in dredging equipment air emissions (Abood 2007). Specifically, Abood identifies the reduction in emissions from ships through the use of alternative fuels, retrofitting engines, addition of emission reduction devices such as catalysts, and reductions in light loading and tidal delays by deepening channels. Interestingly, the deepening of channels would require additional dredging that could increase rather than reduce air emissions. This study addresses reductions in air emissions but does not look at selecting the dredging equipment that would reduce emissions while maintaining navigation channel dredging.

The U.S. Environmental Protection Agency (USEPA) and USACE have collaborated in the development of a document titled “Evaluating the Environmental Effects of Dredged Material Management Alternatives – A Technical Framework” (USEPA, 2004). This framework provides overall guidance for the application of detailed testing manuals developed by USACE and USEPA (Table 2.1). These technical testing and design manuals address aquatic and terrestrial impacts from the dredging and placement operations, including the potential for volatization of contaminants into the atmosphere. None, however, consider the air emissions from the dredging equipment in the design and equipment selection process.

Table 2.1: Dredging and Dredged Material Manuals

Manual	Agency	Published
Evaluating Environmental Effects of Dredged Material Management Alternatives – A Technical Framework (USEPA 2004)	EPA and USACE	2004
Dredging and Dredged Material Disposal (USACE 1983)	USACE	1983
Beneficial Uses of Dredged Material (USACE 1987-A)	USACE	1987
Confined Disposal of Dredged Material (USACE 1987-B)	USACE	1987
Evaluation of Dredged Material Proposed for Ocean Disposal (Ocean Testing Manual) (USEPA 1991)	EPA and USACE	1991
Evaluation of Dredged Material for Discharge in Waters of the U.S. – Testing Manual (Inland Testing Manual) (USEPA 1998)	EPA and USACE	1998
Evaluation of Dredged Material Proposed for Disposal at Island, Nearshore, or Upland Confined Disposal Facilities – Testing Manual (Upland Testing Manual) (USACE 2003-B)	USACE	2003

2.3 Dredged Material Emissions to the Atmosphere

Emissions to the atmosphere from dredging operations include the volatization of chemicals from contaminated dredged material within both the placement site and re-suspended in the water column and emissions from marine engines used to power dredging equipment. The rate at which specific chemicals volatize from dredged material has been studied using various models. Volatization rates for hydrophobic organic compounds from four different locations were modeled to tentatively rank the magnitude of emission rates. The four locations were the dredging location or cut, the exposed placement site location, the ponded placement site location, and the placement site location with vegetated cover (Valsaraj 1995). The results indicated that the greatest emissions resulted from the exposed placement site followed by the dredge cut location with high levels of suspended solids (Valsaraj 1995). Air quality impacts from odorous or toxic compounds in dredged material and effects on inhabitants near dredging operations can be costly to control (Zimmer 2004). Multiple models were tested with differing operational and remediation alternatives. The results were evaluated against acute air quality standards and odor threshold (Zimmer 2004). Neither of these studies considered the air emissions from dredging equipment.

2.4 Regulation of Air Emissions From Marine Engines

Air emissions such as Nitrogen Oxides (NOx) from marine engines are being regulated under both the USEPA's "Control of Emissions of Air pollution from New Marine Compression Ignition Engines at or Above 37 kW" and Individual State Implementation Plans (SIP) (Gore 2002). Actions taken to comply with these standards include using shore power instead of marine power when tied up to pier, voluntarily reducing speed when in port to below normal, and potentially limiting industrial equipment operations to a specified number of hours each day (Gore 2002). These standards address air emissions but do not examine the dredging equipment selection process as a source for reducing emissions to the atmosphere.

The significance of United States port air quality concerns are increasing. In response, the USEPA generated the transportation and general conformity rules (Rhoads 2004). These rules require project sponsors to include air quality analysis in their planning process. An approach has been developed based on emission reduction plans that allow projects to maintain general conformity status. Cost estimates are developed that include the type and size of equipment to be used, production rates, hours of operation, and labor requirements that meet existing standards without supplementary air emission control considerations (Rhoads 2004). This approach utilizes a similar approach to that done in this study for quantifying air emissions from diesel equipment but does not use the results for selection of equipment. Nor does it focus on navigation maintenance dredging but considers all equipment required for unspecified projects.

2.5 Summary

Considerable effort has been put forth to identify and reduce environmental impacts from dredging operations. Reductions in adverse impacts have been achieved through the identification and implementation of beneficial uses for dredged material, development of environmental dredging techniques, minimization of the volatization of compounds from contaminated dredged material, and striving toward compliance with air quality standards. The reuse of dredged material for construction materials, aquaculture, topsoil, beach nourishment, berm creation, capping, land creation, land improvement, fill, shore erosion protection, habitat enhancement, and wetland restoration has minimized the need for long-term placement sites and the resulting impacts to both aquatic and terrestrial environments. Removal of contaminated sediments minimizes the risk of contaminants migrating into the water column or biota. Identifying solutions that minimize volatization of contaminates from dredged material either from a placement site or when re-suspended in the water column help to reduce environmental impacts. In addition, the adaptation of air quality standards for marine engines reduces adverse impacts to the environment. All of these efforts significantly improve the sustainability of dredging operations and reduce environmental impacts. One potential area for reducing adverse environmental impacts that is conspicuously missing from this list is the quantification and selection of comparable dredging equipment based on the air emissions. By identifying the type of dredging equipment with the lowest air emissions, when cost, site conditions, and equipment availability are comparable, environmental impacts can be minimized without compromising the dredging project.

CHAPTER 3: PROCEDURE

A Limited Life Cycle Assessment (LCA) was used to evaluate the adverse environmental impacts, specifically harmful emissions to the atmosphere, resulting from two comparable dredging operations. The primary purpose of this study is to provide dredging decision makers with a tool to help select equipment for each dredging operation that will reduce the negative environmental impacts as defined in this LCA.

3.1 Limited Life Cycle Assessment (LCA) Procedure

Since the selection process would be limited to the dredging equipment available within a given region and would not include the purchase or disposal of that equipment, this LCA was limited to the "use" phase only. Additionally, it could be argued that the long life span of most dredging equipment would result in the manufacture and disposal phases contributing negligible impacts relative to the use phase. Finally, a limited LCA was utilized due to inadequate availability of data for any type of dredging or comparable construction equipment.

The procedure developed for this study utilizes existing tools to define and calculate fuel consumed, air emissions, and cost per CY for the identified scenarios (Figure 3.1). A total of 13 tasks make up the procedure. Task 1: Identify Dredging Equipment, determine what size and type of equipment is available through contract or organizationally owned; Task 2: Identify Air Emission Data, define what air emission data will be used as an input for the Eco-Efficiency Analysis. This could be from NREL (Section 3.1.1) as used in this study or from another source; Task 3: Determine Production Rates, Identify the anticipated production rates for dredging equipment evaluated using this procedure considering sediment characteristics and volume, maintaining navigation, transport distance, placement site location and management, and potential equipment down time; Task 4: Determine Dredging Volume: calculate the anticipated dredging volume based on hydrographic surveys and channel design template; Task 5: Determine Transport Distance: calculate total transport distance based on dredge cut and placement site location; Task 6: Formulate Scenarios, used the information from tasks 3 through 5 to define potential scenarios for evaluation; Task 7: Calculate Transport and Dredging Times, following the steps outlined in Section 3.1.2; Task 8: Calculate Fuel Consumption: following the steps outlined in Section 3.1.2; Task 9: Perform Eco-Efficiency Analysis, following steps outlined in Section 3.3; Task 10: Estimate Cost per Cubic Yard: following steps outlined in Section 3.2 or another cost estimating procedure; Task 11: Calculate Tradeoff Index Value, following steps outlined in Section 3.4; Task 12: Evaluate Results, using the steps and graphs outlined in Chapter 4; and Task 13: Select Dredging Equipment, Select the dredging equipment that will produce the least air emissions based on the results evaluated in Task 12.

This procedure is applied to compare common channel maintenance dredging equipment used on the IWW in this study. However, the procedure and tools defined for this study can easily be utilized to compare types of dredging equipment from different location and/or purposes.

Multiple scenarios were developed to produce an "envelope" of results applicable to a broad range of site conditions. A total of 48 scenarios were analyzed that varied the quantity of material to be dredged, transport distances from the dredge cut to the placement site, and production rates for each type of dredging equipment. The production rates and transport distances used in this study are based on Rock Island District historical records. The range of dredged material volumes, however, was selected by the author to identify transition points between the two types of dredging equipment in this study.

The volume of dredged material included a relatively small quantity of 1,000 CY, intermediate quantities of 5,000 CY and 20,000 CY, and a large quantity of 100,000 CY. This range of volumes was designed to provide scenarios targeted at the strengths of each type of dredging equipment in this study. Typically, it is more economical to use a mechanical bucket dredge for small quantities of dredged material at multiple locations and also when transport distances are longer than a cutterhead pipeline dredge is capable of pumping without re-handling. Cutterhead pipeline dredges tend to be more cost effective for large quantities of dredged material at a given location with relatively short pumping distances.

Transport distances were selected based on the capabilities of the cutterhead pipeline dredge. The maximum distance the cutterhead pipeline dredge can typically pump dredged material slurry without using a booster pump is 8,000 feet, the addition of one booster pump extends this to 10,000 feet and two booster pumps allow for a 12,000 foot transport distance. The longest transport distance of 16,000 feet was intended to evaluate a scenario where the cutterhead pipeline dredge would need to double-handle the material to reach the placement site. Double-handling of dredged material is not generally considered an acceptable option due to the adverse impacts to the aquatic environment that could result. This range of transport distance, again, was selected to target strengths of both types of equipment evaluated and assumes sandy sediment typically found in the Illinois Waterway (IWW) where these dredges operated during the 2005 season.

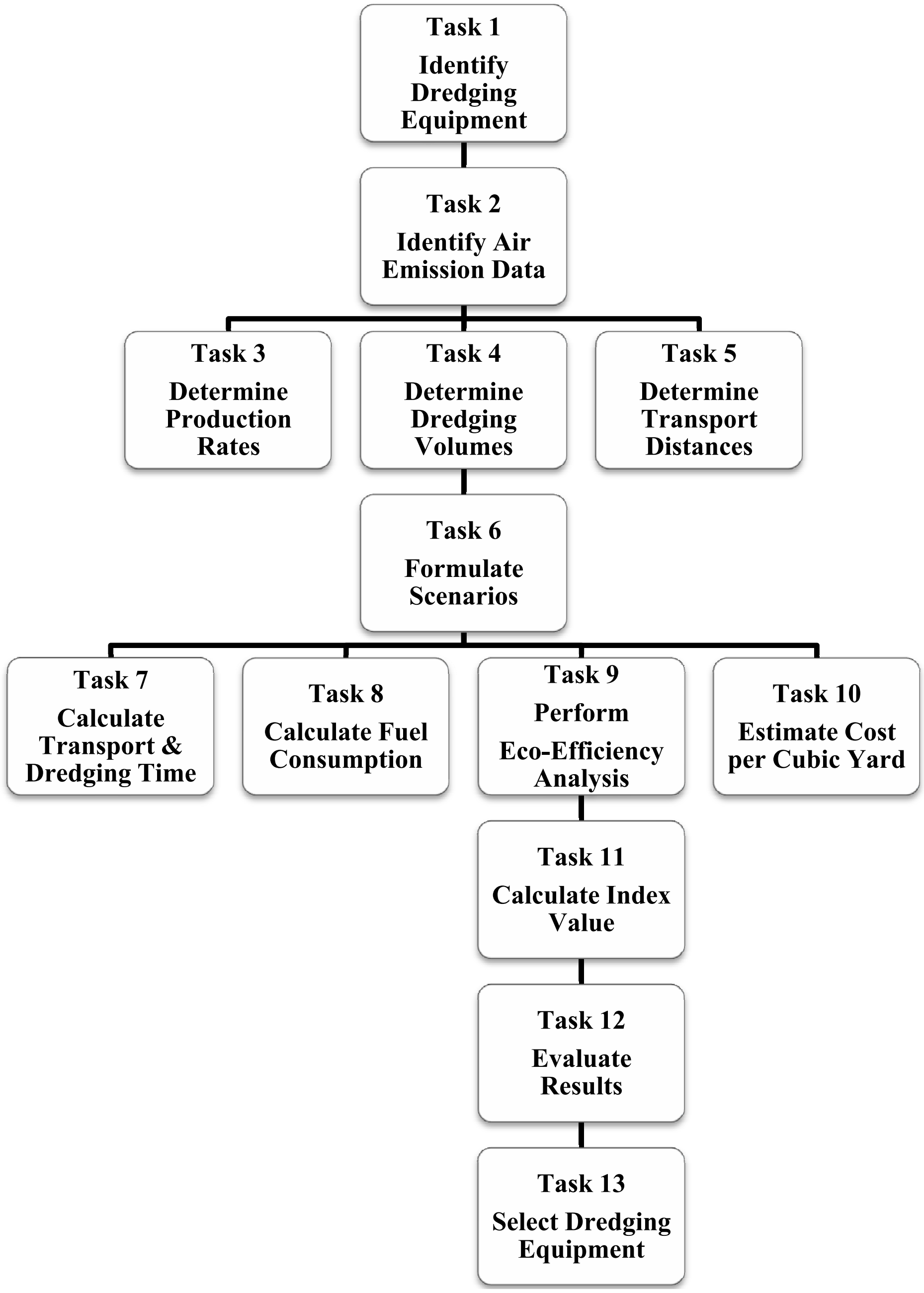

Figure 3.1: Procedure Flow Chart

Production rates can vary depending on many factors including: the type of material being dredged, minimizing potential delays to navigation, transport distance, placement site location and management, and equipment down time. Because the production rate can vary from one dredging event to the next, a range was used in this analysis. The production rates selected included the lowest, average, and highest rates for each crew. For the mechanical bucket dredge crew the volume and total number of days, at 10 hours per day, for each event done during the 2005 dredging season were used to calculate low, average, and high production rates (Graham 2007/08) (Table 3.1). The dredging events included were limited to those with sandy material to be consistent with the events done by the cutterhead pipeline dredge. The cutterhead pipeline dredge production rate was calculated using the total time on-site and volume for each dredging event (Graham 2007/08) (Table 3.2). The same contractor-owned dredged was used for navigation channel maintenance dredging for the 2002, 2003, and 2005 season. Including all three years expanded the number of events from 7 to 25 yielding production rates that better reflected this crew's capabilities.

Table 3.1: Mechanical Bucket Dredge Production Rates (Graham 2007/08)

Month Dredged	Dredge Cut	Days	Hrs/day	Total CY	Production Rate (CY/hr)
Apr	RIVER MILE 87.7 BEARDSTOWN	7	10	3,560.0	50.9
	RIVER MILE 87.7 LAST R.I. BARGE-END OF BEARDSTOWN	9	10	11,150.1	61.9
May	RIVER MILE 244 MARSEILLES LOWER CUT "A&B"	15	10	3,826.6	25.5
June	RIVER MILE 247 MARSEILLES CANAL CUT "A"	6	10	1,592.2	26.5
	RIVER MILE 247 MARSEILLES CANAL CUT "B"	3	10	981.5	32.7
July	RIVER MILE 241 BULLS ISLAND CUT "A"	4	10	1,785.0	44.6
	RIVER MILE 241 BULLS ISLAND CUT "B"	7	10	4,166.4	59.5
	RIVER MILE 241 BULLS ISLAND CUT "C"	1	10	397.4	39.7
	RIVER MILE 241 BULLS ISLAND CUT "D"	3	10	1,104.2	36.8
Aug	RIVER MILE 229.9 LEFT, CUT "A"	7	10	2,150.2	30.7
	RIVER MILE 229.9 LEFT, CUT "B"	11	10	3,432.3	31.2
	RIVER MILE 229.9 LEFT, CUT "C"	1	10	198.4	19.8
Sept	RIVER MILE 229.9 LEFT, CUT "C"	10	10	3,295.3	33.0
	RIVER MILE 270.8 LEFT, CUT "A"	2	10	601.4	30.1
Oct	RIVER MILE 270.8 LEFT, CUT "A"	9	10	3,583.6	39.8
	RIVER MILE 271.8 LEFT, DRESDEN UPPER CELL	1	10	210.8	21.1
				Minimum	**20**
				Average	**36**
				Maximum	**62**

Table 3.2: Cutterhead Pipeline Dredge Production Rates (Graham 2007/08)

Year Dredged	Volume Dredged *(CY)*	Total Time *(hrs)*	Production Rate *(CY/hr)*	Year Dredged	Volume Dredged *(CY)*	Total Time *(hrs)*	Production Rate *(CY/hr)*
2005	68,487	449	153	2003	15,830	82	192
2005	72,439	479	151	2002	28,313	316	90
2005	15,085	264	57	2002	9,572	88	109
2005	30,957	611	51	2002	15,232	130	117
2005	25,936	423	61	2002	22,547	190	119
2005	17,873	180	99	2002	6,186	84	74
2005	10,044	61	165	2002	5,273	56	94
2003	51,997	597	87	2002	5,114	67	76
2003	40,430	259	156	2002	14,766	187	79
2003	13,633	187	73	2002	6,682	103	65
2003	18,525	126	147	2002	17,206	144	119
2003	19,450	220	89			**MINIMUM**	**51**
2003	27,492	169	162			**AVERAGE**	**108**
2003	8,380	70	119			**MAXIMUM**	**192**

3.1.1 *LCA Methodologies and Data*

Navigation channel maintenance dredging equipment used on the IWW and Upper Mississippi River (UMR), as with most locations, needs to be mobile and capable of operation without an external power source, making diesel fuel the predominate choice. All of the equipment included in this study is diesel powered (Table 3.3). The combustion of diesel fuel releases pollutants to the atmosphere that can be quantified and compared between dredging crews to determine the lowest adverse environmental impacts for each type of equipment and scenario.

The pollutant data used for this LCA are emissions from diesel fuel combustion in industrial equipment per 1,000 gallons of fuel burned (NREL, 2003) (Table 3.4). This data was entered into SimaPro LCA software as a process then applied to each of the scenarios yielding the environmental impacts for each quantity dredged, transport distance, and production rate. The diesel powered equipment with the rated horsepower required to mobilize and operate each type of dredge was taken from U.S. Army Corps of Engineers, Rock Island District (Graham 2007/08) records for the 2005 dredging season (Table 3.3).

Table 3.3: Dredging Equipment's Rated Horsepower (Graham 2007/08)

Mechanical Bucket Dredge			Cutterhead Pipeline Dredge		
Equipment	**Qty**	**Rated Horsepower**	**Equipment**	**Qty**	**Rated Horsepower**
Excavator	1	429	Main Engine	1	960
M/V LaSalle	2	400	Cutter Head Engine	1	200
Gen Set (LaSalle)	1	80	Booster Pumps	2	700
Dozer (D6T)	1	200	Spud Hyd Drive Engine	1	125
Dozer (950G)	1	183	Gen Set (Dredge-300kW)	1	400
Gen Set (Crane Barge)	2	225	Gen Set (Dredge-35kW)	1	60
			Tender (Max)	1	400
			Tender (Scotty)	1	400
			Tender (Debra Ann) (Mob Only)	1	400
			Tractor	1	140
			Tractor	1	80
			Crissafully Pump	1	160
			Anchor Barge	3	125
			Crane	1	125
			Light Plants	2	25

Table 3.4: Outputs to Nature from Diesel Fuel Combustion (NREL 2003)

Substance	**Mass** *(lbs)*	**Substance**	**Mass** *(lbs)*
Acectaldehyde	0.1064	Nitrogen oxide	0.5661
Acrolein	0.0128	PAH, polycyclic aromatic hydrocarbons	0.0233
Benzene	0.1294	Particulates (PM10)	13.7727
Butadiene	0.0054	Propene	0.3578
Carbon dioxide (fossil)	22,543.4325	Toluene	0.0567
Carbon monoxide	117.0765	Sulfur oxides	4.9956
Formaldehyde	0.1637	VOC (unspecified)	11.2820
Methane	1.1152	Xylenes	0.0395
Nitric Oxide	440.7493		

3.1.2 *Diesel Fuel Consumption*

The diesel fuel usage was estimated for all equipment used to mobilize or operate each dredging crew for every scenario (Appendix B). Each piece of diesel powered equipment was identified for use during the transportation and/or dredging phase of the operation. The time for each dredging crew and phase was estimated based on average travel speeds, distance traveled for mobilization and transport of dredged material, volume of dredged material, and three production rates (low, average, and high). Travel speeds for each dredging crew were based on Rock Island District historical data (Graham 2007/08).

Each dredge traveled from a storage/maintenance facility to the initial dredge cut. The mechanical bucket dredge is owned and operated by the U.S. Army Corps of Engineers, Rock Island District, and is based in Illinois. The cutterhead pipeline dredge is owned and operated by an independent contractor and is based in Michigan. Total distance each dredge traveled, including mobilizing from the respective storage/maintenance facility to the initial dredge cut, between each dredge cut, and back to the base facility, was averaged over the total number of dredge cuts completed that season. A total dredged material transport distance, for the mechanical bucket dredge, was calculated using the total volume of material to be dredged, average barge capacity, and distance between the dredge cut and the placement site. The sum of the average mobilization distance and the transport distance yielded a total travel distance for each dredging crew and event. This total travel distance was divided by the average travel speed yielding a total transport time (Eq. 3.1). A total dredging time was then calculated using the volume of material to be dredged and production rates shown in Tables 3.1 and 3.2 (Eq. 3.2). Additionally, for the cutterhead pipeline dredge, the dredging time is increased for delays that result when dredging operations cease to allow navigation vessels to pass and for managing the dredged material at the placement site. Both the vessel passing time and the placement site time are calculated based on historical percentages from Rock Island District (Graham 2007/08). There are two possible vessel passing scenarios, one when the cutterhead pipeline dredge discharge pipeline crosses the navigation channel (19%) and the other when it does not (10%). For the crossing pipeline the dredge must cease operations and the pipeline must be separated to allow vessels to pass. The pipeline and dredge must only be moved clear of the navigation channel for the non-crossing pipeline. For this study, 100 percent of the dredging operations were assumed to be done with a crossing pipeline. This results in a 32 percent increase for the placement site time and a 19 percent increase for the crossing pipeline time.

$$TransportTime(hrs) = \frac{RiverMilesTraveled(miles)}{AverageSpeed(mph)} \qquad \text{Eq. 3.1}$$

$$DredgingTime(hrs) = \frac{DredgedMaterial(CY)}{ProductionRate\left(CY/hr\right)} * \left(1 + Crossing\% + Placement\%\right) \qquad \text{Eq. 3.2}$$

Total fuel consumed was calculated using standard cost estimating practices as defined in the U.S. Army Corps of Engineers Construction Equipment Ownership and Operating Expense Schedule (USACE, 2005). The process uses the rated brake horsepower (BHP) for each piece of equipment, a horsepower factor (HPF) which is based on an average percentage of the full horsepower being utilized during normal operations, a fuel factor (FF) in gallons/(brake horsepower-hour) (Eq. 3.3), an average weight of the diesel fuel consumed (7 lbs/gallon), the average fuel consumed in lbs./(brake horsepower-hour), and the total time each piece of equipment is in operation (Eq. 3.4).

$$FF=\frac{HPF*\frac{FuelConsumed}{BHP\text{-}Hour}}{FuelWeight/gallon} \qquad \text{Eq. 3.3}$$

$$TotalFuelUsage=OperationTime*BHP*FF \qquad \text{Eq. 3.4}$$

When specific horsepower ratings for a given piece of equipment were not included in the records comparable equipment was selected from the U.S. Army Corps of Engineers Construction Equipment Ownership and Operating Expense Schedule (USACE, 2005). The only change in required equipment over the various scenarios evaluated is the number of booster pumps for the cutterhead pipeline dredge.

Once total times in hours for the transportation and dredging operations were calculated for each scenario the total fuel consumed could be calculated (Eq. 3.4) and input into SimaPro. The total environmental burdens could then be compared to typical decision making criteria. Currently, navigation channel maintenance dredging decisions are based on the cost per cubic yard of material dredged, operational constraints (transport distance, water borne access to the placement site, and overland distance from the channel to the placement site), National Environmental Policy Act (NEPA) compliance, and equipment availability (Table 1.4)) (USACE 2003-A). The placement site constraints, NEPA compliance, and equipment availability are typically defined by factors beyond the scope of this study. Therefore, the environmental burdens for each scenario will be compared with the economic cost of dredging, potential production rates, and transport distances to identify possible decision points.

3.2 Cost Estimating Procedure

The cost per cubic yard of dredged material varies based on several factors including: equipment required, volume of material to be dredged, transport distance, mobilization time and distance, placement site conditions and operations, and the potential for stoppages to avoid adverse impacts on navigation. The total dredging time for each scenario was estimated using a template developed by Rock Island District, Operations Division (Graham 2007/08). This template calculates total dredging time based on the anticipated production rate for that dredge, the volume of sediment to be removed, mobilization/demobilization time, down time for placement site operations, delays required to maintain navigation, and re-handling of the dredged material if required. Three production rates were used for each dredging crew and scenario (low, average, and high) as defined under the LCA Procedure section (Tables 3.1 and 3.2). Four dredged material volumes were analyzed ranging from 1,000 CY to 100,000 CY as outlined in Section 3.1, Limited LCA Procedure. Mobilization/demobilization time, as calculated under the fuel consumption section, was also included. The cutterhead pipeline dredge crew has down time for delays to maintain an open navigation channel, manage the dredged material at the placement site, and for re-handling the dredged material when required that must be accounted for when estimating total dredging time. There are two possible options for maintaining an open navigation channel, one where the cutterhead pipeline dredge discharge pipeline crosses the navigation channel and the other when the discharge pipeline does not. For the crossing option the average increase is 19% of the dredging time and the non-crossing option average is 10% of the dredging time, both based on Rock Island District historic data (Graham 2007/08). In this study all dredging was assumed to include the crossing option. To allow for management of the dredged material within the placement site dredging operations must cease. This additional time was also calculated as a percentage of dredging time based on Rock Island District historic data (Graham 2007/08). The average increase in time for dredged material management at all types of placement sites is 32%. Additional time for re-handling the dredged material, including mobilization/demobilization, was calculated following the same procedure as the initial dredging event. The times for initial and re-handling dredging events were then added together, when applicable.

An average hourly cost for both the cutterhead pipeline dredge and mechanical bucket dredge crews was calculated based on Rock Island District 2005 dredging season records (Graham 2007/08). The total cost of non-emergency dredging done by the cutterhead pipeline dredge crew ($1,171,980) was divided by the total number of days worked, at 24 hours per day (1,680 hours), yielding a cost of $698/hour. For the mechanical bucket dredge crew, records indicate a total cost for the dredging events included in this study of $887,214 and a total time worked of 1,335 hours, resulting in an average cost of $665/hour. See Appendix C for the complete cost estimating procedure and data.

The total time was multiplied by the average cost per hour for each dredging crew yielding a total cost for each scenario in this study. The total cost is then divided by the volume of dredged material for each scenario resulting in a cost per cubic yard (Table 3.5). Normalizing the cost for dredging, on a per cubic yard basis, provides a common scale that allows comparison across multiple scenarios.

3.3 Eco-Efficiency Analysis

This study utilized the emissions from diesel fuel combustion in industrial equipment (NREL, 2003) to define the constituents and mass emitted per gallon of diesel fuel burned. In addition, SimaPro requires the selection of a method used to calculate the environmental burdens for each scenario (Appendix D). The method selected was "Eco-indicator 95 V2.05 / Europe e". Utilizing this method with SimaPro yielded multiple output results:

- Inventory of pollutants (Table 3.6),
- Summary characterization of environmental impact categories (Table 3.7),
- Individual characterization for each environmental impact category with included constituents (Table 3.8),
- Environmental Impact Single Score (EISS).

SimaPro uses weighting factors as multipliers for the impact category results. These weighted values are in common units of points and can then be added together to provide an Environmental Impact Single Score (EISS). The EISS was used to evaluate the environmental burdens for each scenario in this study.

Table 3.5: Dredging Estimated Costs

8,000 ft & 1,000 CY			**8,000 ft & 5,000 CY**			**8,000 ft & 20,000 CY**			**8,000 ft & 100,000 CY**		
Prod. Rate	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*
Low	$56.36	$51.10	*Low*	$37.87	$26.75	*Low*	$34.41	$22.19	*Low*	$33.48	$20.97
Avg	$41.58	$40.19	*Avg*	$23.09	$15.85	*Avg*	$19.63	$11.28	*Avg*	$18.70	$10.06
High	$33.83	$35.92	*High*	$15.35	$11.58	*High*	$11.88	$7.01	*High*	$10.96	$5.79
10,000 ft & 1,000 CY			**10,000 ft & 5,000 CY**			**10,000 ft & 20,000 CY**			**10,000 ft & 100,000 CY**		
Prod. Rate	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*
Low	$56.36	$51.10	*Low*	$37.87	$26.75	*Low*	$34.41	$22.19	*Low*	$33.48	$20.97
Avg	$41.58	$40.19	*Avg*	$23.09	$15.85	*Avg*	$19.63	$11.28	*Avg*	$18.70	$10.06
High	$33.83	$35.92	*High*	$15.35	$11.58	*High*	$11.88	$7.01	*High*	$10.96	$5.79
12,000 ft & 1,000 CY			**12,000 ft & 5,000 CY**			**12,000 ft & 20,000 CY**			**12,000 ft & 100,000 CY**		
Prod. Rate	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*
Low	$56.36	$51.10	*Low*	$37.87	$26.75	*Low*	$34.41	$22.19	*Low*	$33.48	$20.97
Avg	$41.58	$40.19	*Avg*	$23.09	$15.85	*Avg*	$19.63	$11.28	*Avg*	$18.70	$10.06
High	$33.83	$35.92	*High*	$15.35	$11.58	*High*	$11.88	$7.01	High	$10.96	$5.79
16,000 ft & 1,000 CY			**16,000 ft & 5,000 CY**			**16,000 ft & 20,000 CY**			**16,000 ft & 100,000 CY**		
Prod. Rate	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*
Low	$56.36	$72.18	*Low*	$37.87	$47.50	*Low*	$34.41	$42.88	*Low*	$33.48	$41.64
Avg	$41.58	$50.37	*Avg*	$23.09	$25.69	*Avg*	$19.63	$21.06	*Avg*	$18.70	$19.83
High	$33.83	$41.83	*High*	$15.35	$17.15	*High*	$11.88	$12.52	*High*	$10.96	$11.29

Table 3.6: Constituent Inventory

Acectaldehyde	Formaldehyde	Propene
Acrolein	Methane	Toluene
Benzene	Nitric Oxide	Sulfur oxides
Butadiene	Nitrogen oxide	VOC (unspecified)
Carbon dioxide (fossil)	PAH, polycyclic aromatic hydrocarbons	Xylenes
Carbon monoxide	Particulates (PM10)	

Table 3.7: Characterization Environmental Impact Categories

Environmental Impact Category	**Equivalent Units**
Greenhouse Effects	kg CO_2
Acidification	kg SO_2
Eutrophication	kg PO_4
Carcinogens	kg SPM
Winter Smog	kg B(a)P
Summer Smog	kg C_2H_4

Table 3.8: Environmental Impact Category Constituents

Environmental Impact Category	**Constituents**
Greenhouse Effects	Acetaldehyde Carbon Dioxide, Fossil Methane
Acidification	Nitric Oxide Sulfur Oxides Nitrogen Oxides
Eutrophication	Nitric Oxide Nitrogen Oxides
Carcinogens	Polycyclic Aromatic Hydrocarbons, PAH Benzene
Winter Smog	Particulates, < 10 um Sulfur Oxides
Summer Smog	Volatile Organic Compounds, VOC Propene

3.4 Tradeoff Index

For certain scenarios of production rate, transport distance, and volume there may be a clear choice of dredging method if both the cost and EISS are lower. There are some scenarios, however, where one criterion (cost or EISS) is higher and the other lower. In these scenarios, it is helpful to the decision maker to know if a small increase in cost will result in a large or small decrease in EISS. To quantify the cost and EISS tradeoff, a Tradeoff Index I is introduced to identify whether one type of dredge was the better choice and quantify the magnitude of the benefits obtained (Eq. 3.5). This index is calculated using the inverse slope of the Index Value Line which connects the cutterhead pipeline and mechanical bucket dredges values for the EISS and cost per CY at each production rate (Figure 3.2). The Index Value line is illustrated using a double gray line, the cutterhead pipeline dredge (CPD) is shown in red with dashed lines and triangular markers, and the mechanical bucket dredge (MBD) is represented with blue solid lines and square markers. Entering the EISS and cost values for the cutterhead pipeline dredge first generates an Index Value where the sign provides a general determination (Table 3.9).

In the event I is negative one type of dredge has a lower EISS value while the second type of dredge has a lower cost per CY resulting in no clear choice between dredging equipment. A positive value of I indicates that one of the dredge types has a lower EISS value and cost per CY but the decision-maker will need to look at the results to determine which type of equipment would be the better choice.

High I values identify situations in which there is a high reduction in environmental impacts for a small increase in cost and, therefore may be considered worth employing. The converse is true for low values of I.

Terms used in Eq. 3.5 and Figure 3.2 are defined as follows:

- CPD – Cutterhead Pipeline Dredge
- MBD – Mechanical Bucket Dredge
- EISS – Environmental Impact Single Score
- Cost – Cost per Cubic Yard
- High – High Production Rate
- Avg – Average production Rate
- Low – Low Production Rate

$$I=\frac{\left(EISS_{High_{CPD}}\text{-}EISS_{High_{MBD}}\right)}{\left(Cost_{High_{CPD}}\text{-}Cost_{High_{MBD}}\right)} \qquad \text{Eq. 3.5}$$

Table 3.9: Tradeoff Index Value, *I*, General Sign Determination

Numerator	Denominator	Tradeoff Index Value	Determination
Positive	Positive	Positive	Mechanical Bucket Dredge
Positive	Negative	Negative	No Clear Choice
Negative	Positive	Negative	No Clear Choice
Negative	Negative	Positive	Cutterhead Pipeline Dredge

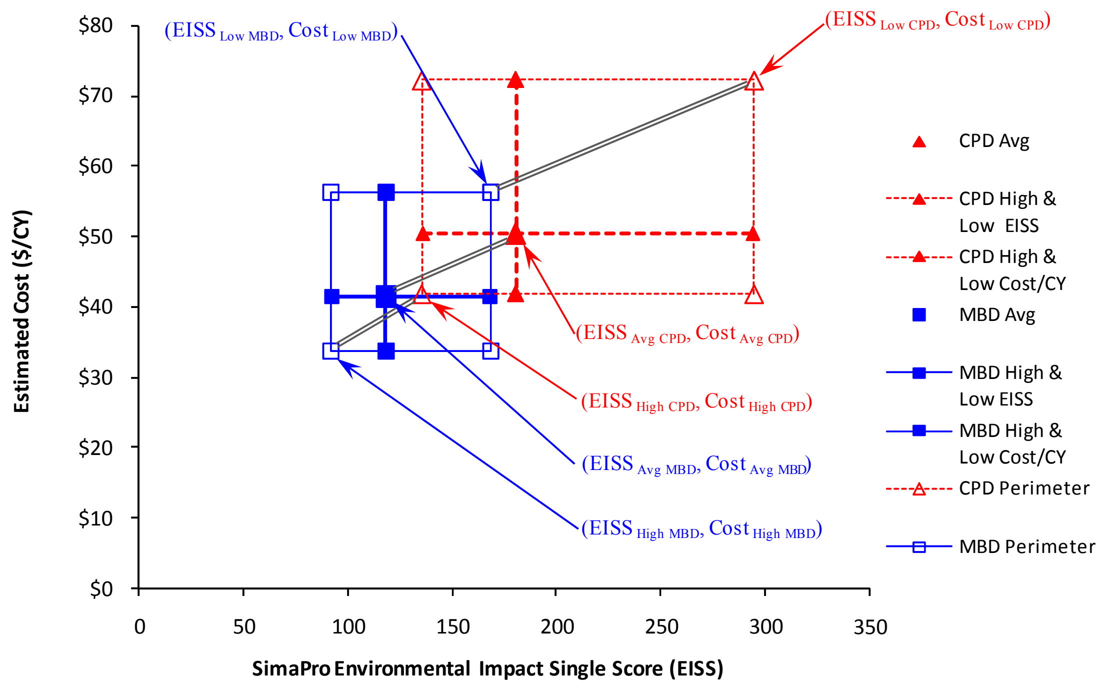

Figure 3.2: Tradeoff Index Value, *I* – Example for 1,000 CY and 16,000 ft

CHAPTER 4: RESULTS

A total of 48 scenarios were analyzed comparing two types of dredging equipment, the cutterhead pipeline dredge and the mechanical bucket dredge. The parameters varied included the quantity of material to be dredged, transport distances from the dredge cut to the placement site, and production rates for each type of dredging equipment. See Section 3.1 for a complete explanation of these parameters. This yielded an “envelope” of results applicable to a broad range of potential site conditions.

The volume of dredged material ranged from a relatively small quantity of 1,000 cubic yards (CY) to intermediate quantities of 5,000 CY and 20,000 CY up to a large quantity of 100,000 CY. Transport distances were selected based on the typical capabilities of the cutterhead pipeline dredge: alone with no booster pumps (8,000 ft); with one booster pump (10,000 ft); with two booster pumps (12,000 ft); and a maximum distance that would require double-handling of the dredged material (16,000 ft). This range of transport distances was selected to target strengths of both types of equipment evaluated and assumes sandy sediment typically found in the Illinois Waterway (IWW) where these dredges operated during the 2005 season. Production rates can vary from one dredging event to the next depending on multiple factors including: the type of material being dredged, minimizing potential delays to navigation, transport distance, placement site location and management, and equipment down time. Therefore, a range was used in this analysis. The production rates selected included the lowest, average, and highest rates for each dredging crew (Table 4.1) based on Rock Island District records. See Section 3.1 for complete production rate procedures and data (Graham 2007/08). The dredging events included were limited to those with sandy material to be consistent with the events done by the cutterhead pipeline dredge.

Table 4.1: Dredge Crew Production Rates

	Production Rate *(CY/hr)*	
	CPD	**MBD**
Low	51	20
Average	108	36
High	192	62

4.1 Presentation of Results

The total diesel fuel consumed for each dredging crew and scenario was calculated as outlined in Section 3.1.2 with the volumes summarized in Table 4.2. The diesel fuel consumed could be used to evaluate each scenario and determine which dredging equipment would have the lowest emissions to the atmosphere since the relationship between emissions and fuel consumed is linear. However, comparing diesel fuel consumed alone would not adequately illustrate the potential reduction in environmental impacts. Using a limited LCA provides the capability to evaluate by the quantity of each constituent emitted (Table 3.6), each environmental impact category

(Table 3.7), and by a total Environmental Impact Single Score (EISS). See Section 3.3 for the Eco-efficiency Analysis.

Table 4.2: Diesel Fuel Consumption by Dredging Event, in Gallons

	1,000 CY			5,000 CY			20,000 CY			100,000 CY		
8,000 ft	**Prod. Rate**	**MBD**	**CPD**	**Prod. Rate**	**MBD**	**CPD**	**Prod. Rate**	**MBD**	**CPD**	**Prod. Rate**	**MBD**	**CPD**
	Min	5,140	5,818	**Min**	19,807	19,379	**Min**	74,807	70,233	**Min**	368,142	341,454
	Avg	3,573	4,028	**Avg**	11,970	10,432	**Avg**	43,460	34,446	**Avg**	211,405	162,523
	Max	2,751	3,328	**Max**	7,862	6,930	**Max**	27,028	20,438	**Max**	129,244	92,481
10,000 ft	**Prod. Rate**	**MBD**	**CPD**	**Prod. Rate**	**MBD**	**CPD**	**Prod. Rate**	**MBD**	**CPD**	**Prod. Rate**	**MBD**	**CPD**
	Min	5,178	6,670	**Min**	19,994	23,642	**Min**	75,554	87,287	**Min**	371,878	426,725
	Avg	3,610	4,431	**Avg**	12,157	12,445	**Avg**	44,207	42,500	**Avg**	215,141	202,790
	Max	2,789	3,554	**Max**	8,049	8,062	**Max**	27,775	24,968	**Max**	132,980	115,131
12,000 ft	**Prod. Rate**	**MBD**	**CPD**	**Prod. Rate**	**MBD**	**CPD**	**Prod. Rate**	**MBD**	**CPD**	**Prod. Rate**	**MBD**	**CPD**
	Min	5,215	7,523	**Min**	20,181	27,906	**Min**	76,302	104,341	**Min**	375,614	511,995
	Avg	3,648	4,834	**Avg**	12,344	14,459	**Avg**	44,954	50,553	**Avg**	218,877	243,057
	Max	2,826	3,781	**Max**	8,236	9,195	**Max**	28,522	29,498	**Max**	136,716	137,781
16,000 ft	**Prod. Rate**	**MBD**	**CPD**	**Prod. Rate**	**MBD**	**CPD**	**Prod. Rate**	**MBD**	**CPD**	**Prod. Rate**	**MBD**	**CPD**
	Min	5,280	9,241	**Min**	20,507	36,363	**Min**	77,609	138,071	**Min**	382,152	680,514
	Avg	3,713	5,663	**Avg**	12,671	18,470	**Avg**	46,262	66,499	**Avg**	225,414	322,653
	Max	2,891	4,262	**Max**	8,563	11,466	**Max**	29,830	38,482	**Max**	143,254	182,569

The results from the limited LCA will be presented in two alternate forms. First as a comparison of EISS versus cost per CY for each volume of dredged material and transport distance and second as a comparison of EISS and cost per CY versus transport distance for each volume of dredged material. The inclusion of total cost per cubic yard of dredged material in the evaluation allows a decision to be made that balances economics and environmental impacts.

4.2 EISS versus Cost per CY

A total of four dredged material volumes and four transport distances yields 16 EISS-versus-cost scenarios to be evaluated (Figures 4.1 – 4.16). Each graph is formatted with the cutterhead pipeline dredge in red (lighter shade) with triangular markers and dashed lines and the mechanical bucket dredge in blue (darker shade) with square markers and solid lines. The largest marker is for the average production rate and cost for each dredging crew with the medium sized markers signifying the low and high cost per CY at the EISS for the average production rate and the smallest markers signifying the low and high EISS at the average cost per CY. The EISS and cost axis scales are held constant for each volume of dredged material. It was not realistic to set a single scale for all volumes of dredged material because of the wide range of values, particularly the EISS which went from a low of 87 to a high of 21,678, over the four volumes of dredged material. Additionally, utilizing the same axis scale across multiple dredging volumes is not necessary for this study since the quantity of dredged material is determined by the site conditions. This style of graph allows the decision-maker to compare the cost and EISS for different types of dredging equipment and production rates. Impacts to the EISS and cost per CY resulting from changes in production rate can easily be seen and incorporated into the selection process for dredging equipment.

4.2.1 *Variable Transport Distances and Constant Dredged Material Volumes*

One way to evaluate dredging equipment air emissions is to consider a constant volume of dredged material over increasing transport distances. This is the most desirable graphical evaluation process because graphs with the same quantity of dredged material have the same scales. This type of analysis would be more applicable when the volume cannot be changed but multiple placement site locations, and thus multiple transport distances, are being considered.

For small volumes such as the 1,000 CY scenario the mechanical bucket dredge has a lower EISS for all transport distances included in this study. In addition, the cost per CY for the mechanical bucket dredge is lower for the longest transport distance at all production rates, slightly lower for all transport distances when the production rate is high, and slightly higher for the low and average production rates at 8,000 feet, 10,000 feet, and 12,000 feet (Figures 4.1, 4.2, 4.3 and 4.4). The selection of a mechanical bucket dredge would result in lower air emissions for small quantities of dredged material at a lower to comparable cost depending on the transport distance and production rate.

When the volume increases to 5,000 CY, at an 8,000 foot transport distance, the EISS is lower for the cutterhead pipeline dredge at all production rates (Figure 4.5). The EISS increases at a faster rate for the cutterhead pipeline dredge as the transport distance gets longer resulting in a slightly higher EISS at 10,000 feet and a higher EISS than the mechanical bucket dredge for the 12,000 and 16,000 foot distances (Figures 4.6, 4.7 and 4.8). The cutterhead pipeline dredge has a lower cost per CY than the mechanical bucket dredge for 8,000, 10,000, and 12,000 foot transport distances but this reverses at the 16,000 foot transport distance with the mechanical bucket dredge having a lower cost per CY (Figures 4.5, 4.6, 4.7 and 4.8). As previously stated, the mechanical bucket dredge is more efficient for the 16,000 foot transport distance (Figure 4.8). The cutterhead pipeline dredge has lower air emissions and cost per CY for the 8,000 foot scenario, making it the better choice from both the environmental and economic perspectives (Figure 4.5). The cutterhead pipeline dredge has a lower cost per CY and comparable EISS at 10,000 feet for average and high production rates making it as better choice than the mechanical bucket dredge (Figure 4.6). At 10,000 feet with a low production rate and 12,000 feet for all production rates a decision would have to be made between lower costs or lower air emissions (Figures 4.6 and 4.7).

In the cases considering 20,000 CY of dredged material the EISS and cost per CY for the cutterhead pipeline dredge is lower than for the mechanical bucket dredge at an 8,000 foot transport distance (Figure 4.9). The EISS for the cutterhead pipeline dredge increases, relative to the mechanical bucket dredge, as the transport distance increases and booster pumps or double-handling are added. At 10,000 feet the EISS is lower for the cutterhead pipeline dredge at a high production rate, slightly lower at an average production rate, and higher at a low production rate (Figure 4.10). For both 12,000 and 16,000 foot transport distances the mechanical bucket dredge has a lower EISS (Figures 4.11 and 4.12). The cost per CY, on the other hand, is higher for the mechanical bucket dredge for all scenarios except the 16,000 foot transport distance where the mechanical bucket dredge is slightly lower, due primarily to the double-handling of the dredged material by the cutterhead pipeline dredge (Figure 4.12). Selection of a cutterhead pipeline dredge makes sense environmentally and economically for the 8,000 foot transport distances for all production rates (Figures 4.9). At 10,000 feet the cutterhead pipeline dredge has a lower EISS and cost per CY for average and high production rates with a choice required between lower cost or EISS at the low production rate (Figure 4.10). The mechanical bucket dredge has a lower EISS and higher cost per CY at 12,000 feet for all production rates (Figure 4.11). With a lower EISS and cost per CY the mechanical bucket dredge is the better choice for a transport distance of 16,000 feet at all production rates (Figure 4.12).

For large volumes such as the 100,000 CY scenario the EISS and cost per CY are lower for the cutterhead pipeline dredge at an 8,000 foot transport distance (Figure 4.13). The EISS increases as the distance increases and is slightly lower for the cutterhead pipeline dredge at 10,000 feet for average and high production rates while remaining higher than the mechanical bucket dredge for low production rates (Figure 4.14). At 12,000 feet the EISS is higher for the cutterhead pipeline dredge at all production rates with the largest difference at the low production rate (Figure 4.15). The EISS for a mechanical bucket dredge is lower at all production rates when the transport distance reaches 16,000 feet (Figure 4.16). The cost per CY is lower for the cutterhead pipeline dredge for all scenarios except for a 16,000 foot transport distance where it is slightly higher for the average and high production rates but could be considered comparable. The cost per CY for a cutterhead pipeline dredge at a low production rate is higher. The cutterhead pipeline dredge is clearly a better choice for 8,000 feet at all production rates and 10,000 feet with average or high production rates since the EISS is lower to comparable and the cost is lower than the mechanical bucket dredge (Figures 4.13 and 4.14). At 10,000 feet with a low production rate the cutterhead pipeline dredge has a slightly higher EISS (Figure 4.14). For the 12,000 foot transport distance the cutterhead pipeline dredge has a lower cost per CY but the EISS is higher, forcing a choice between lower environmental impacts or cost (Figure 4.15). When double-handling is required for the cutterhead pipeline dredge the mechanical bucket dredge, with a lower EISS and cost per CY, is definitely the better selection (Figure 4.16).

In all cases where double-handling of the dredged material is necessary because transport distance exceeds the cutterhead pipeline dredge pumping capabilities the mechanical bucket dredge has a lower EISS and cost per CY. This makes the mechanical bucket dredge the obvious choice for transport distances greater than 16,000 feet (Figures 4.4, 4.8, 4.12 and 4.16). A mechanical bucket dredge is typically more efficient for long transport distances, which is consistent with the findings of this study.

4.2.2 *Variable Dredged Material Volumes and Constant Transport Distances*

A second way to analyze this data is to compare the four volumes of dredged material with the transport distance held constant. A certain amount of care needs to be taken when comparing these graphs since the EISS and cost per CY scales change as the quantity changes. This would be applicable if there is only one dredge cut and placement site location to be considered and the volume of dredged material could be varied to stay within a total cost ceiling, for example.

In all instances with a 16,000 foot transport distance the EISS and cost per CY were higher for the cutterhead pipeline dredge (Figures 4.4, 4.8, 4.12 and 4.16). In all cases except the 1,000 CY scenario the cost was only slightly higher and could be considered comparable. When the transport distance reaches a point where a cutterhead pipeline dredge would be required to double-handle the dredged material a mechanical bucket dredge is more efficient than a cutterhead pipeline dredge from both an air quality and economic standpoint. These results are consistent with the strengths of a mechanical bucket dredge crew to be well suited for long transport distances, as outlined in Section 1.3.

When considering the 12,000 foot transport distance the mechanical bucket dredge had lower EISS and higher cost per CY for all cases except for the 1,000 CY scenario, where the cost is only slightly higher for the average and high production rates and could be considered comparable (Figures 4.7, 4.11 and 4.15). When the low production rate for 1,000 CY is considered the mechanical bucket dredge has both a lower EISS and cost per CY (Figure 4.3). Additionally, there is a wider variation between dredging crews in cost and EISS as the production rate decreases. For the 1,000 CY volume the mechanical bucket dredge has a lower EISS with lower to comparable cost per CY depending on the production rate, making it the more efficient choice (Figure 4.3). As the volume increases the difference in EISS between the types of dredges decreases while the cost difference increases, particularly for the low and average production rates (Figures 4.7, 4.11 and 4.15). This would require a decision between reducing air emissions and lower cost.

In the cases with a 10,000 foot transport distance the cost per CY for the 1,000 CY scenario is lower for the mechanical bucket dredge at the high production rate and slightly higher but comparable at the average and low production rates (Figure 4.2). The EISS is lower for the mechanical bucket dredge than that for the cutterhead pipeline dredge at all production rates for this scenario. As the quantity of dredged material increases the EISS shifts to comparable at 20,000 CY for high and average production rates and remains lower for the mechanical bucket dredge at low production rates (Figures 4.6 and 4.10). At 100,000 CY the cutterhead pipeline dredge has a lower EISS except at low production rates where the mechanical bucket dredge has a lower EISS (Figure 4.14). The cost per CY for the cutterhead pipeline dredge remains lower than that for the mechanical bucket dredge for the 5,000, 20,000, and 100,000 CY scenarios at all production rates (Figures 4.6, 4.10 and 4.14). Selection of a mechanical bucket dredge for small volumes of dredged material, irregardless of transport distance, would be the most efficient choice both environmentally and economically. However, as the volume of material to be dredged increases the cutterhead pipeline dredge would be the better choice as long as production rates are average to high. When a low production rate is anticipated a choice between air quality and economics would be required.

For the shortest transport distance of 8,000 feet the mechanical bucket dredge has a lower EISS for 1,000 CY across all three production rates with a slightly lower cost per CY at a high production rate and a slightly higher cost at average and low production rates (Figure 4.1). The cost and EISS increase for the mechanical bucket dredge, relative to the cutterhead pipeline dredge, as the volume of dredged material increases. At 5,000 CY the EISS is slightly lower and the cost is significantly lower for the cutterhead pipeline dredge (Figure 4.5). In the 20,000 CY and 100,000 CY cases the cutterhead pipeline dredge has a lower EISS and cost per CY than those for the mechanical bucket dredge (Figures 4.9 and 4.13). In all cases, except for 1,000 CY, selection of a cutterhead pipeline dredge would result in both reduced air emissions and cost per CY. For a small volume of dredged material the mechanical bucket dredge remains the better choice based on environmental impacts with the cost per CY dependent on the anticipated production rate.

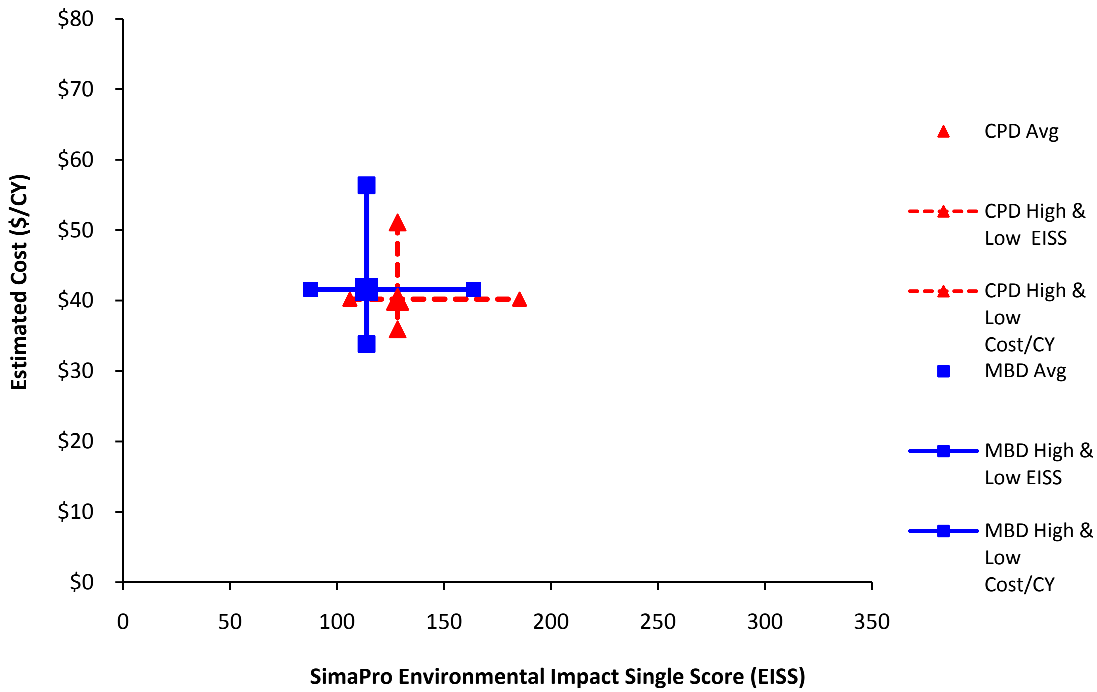

Figure 4.1: EISS vs. Cost – 1,000 CY and 8,000 ft

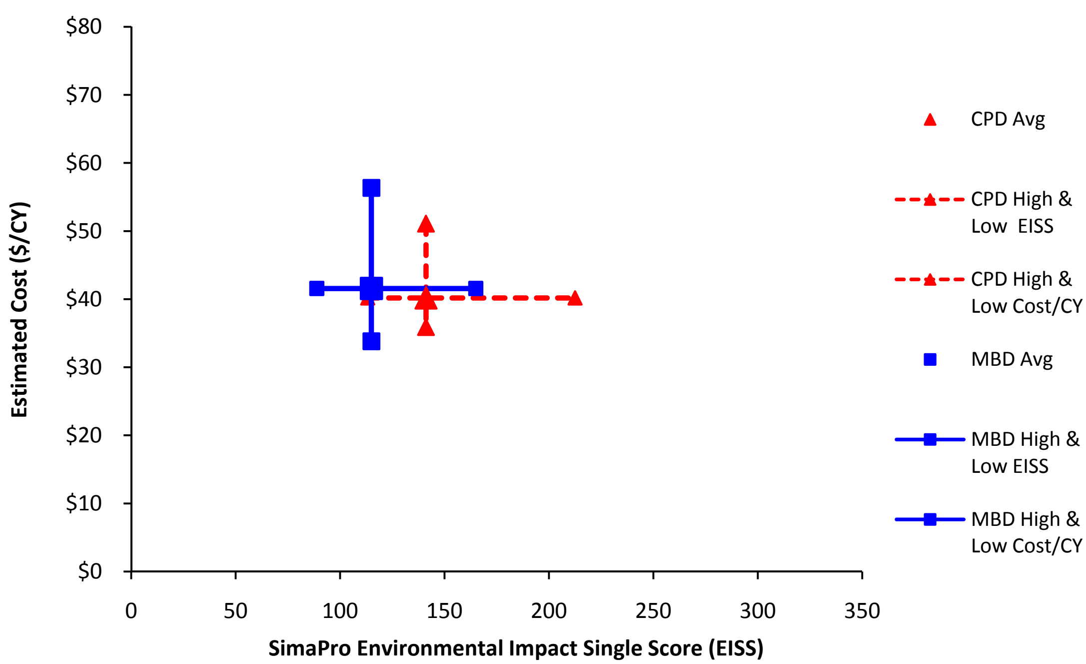

Figure 4.2: EISS vs. Cost – 1,000 CY and 10,000 ft

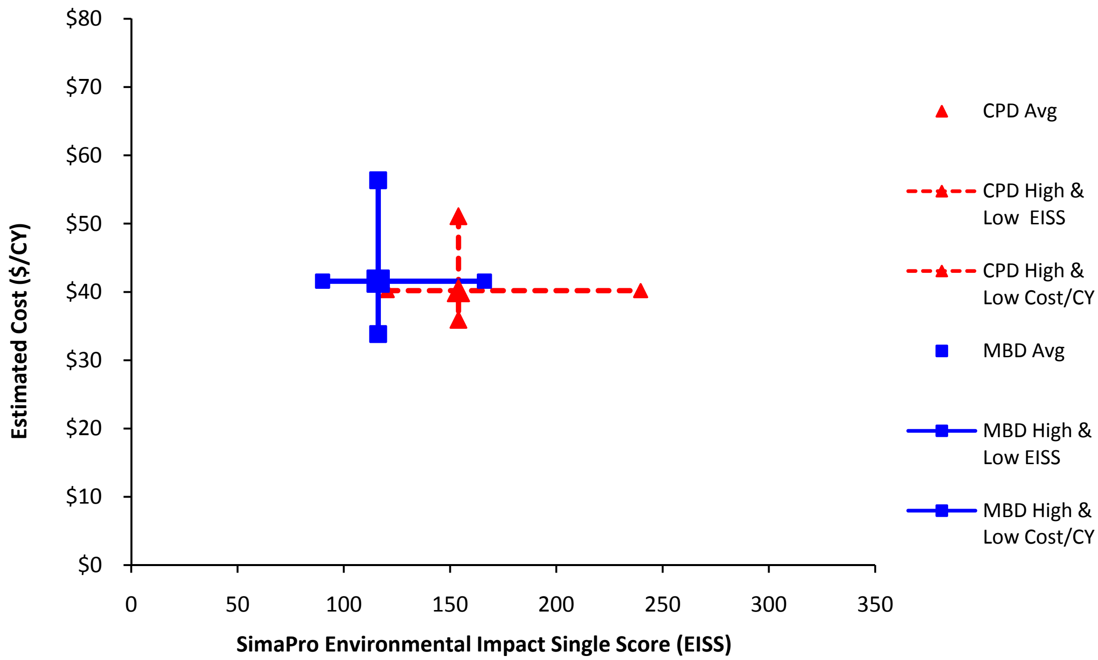

Figure 4.3: EISS vs. Cost – 1,000 CY and 12,000 ft

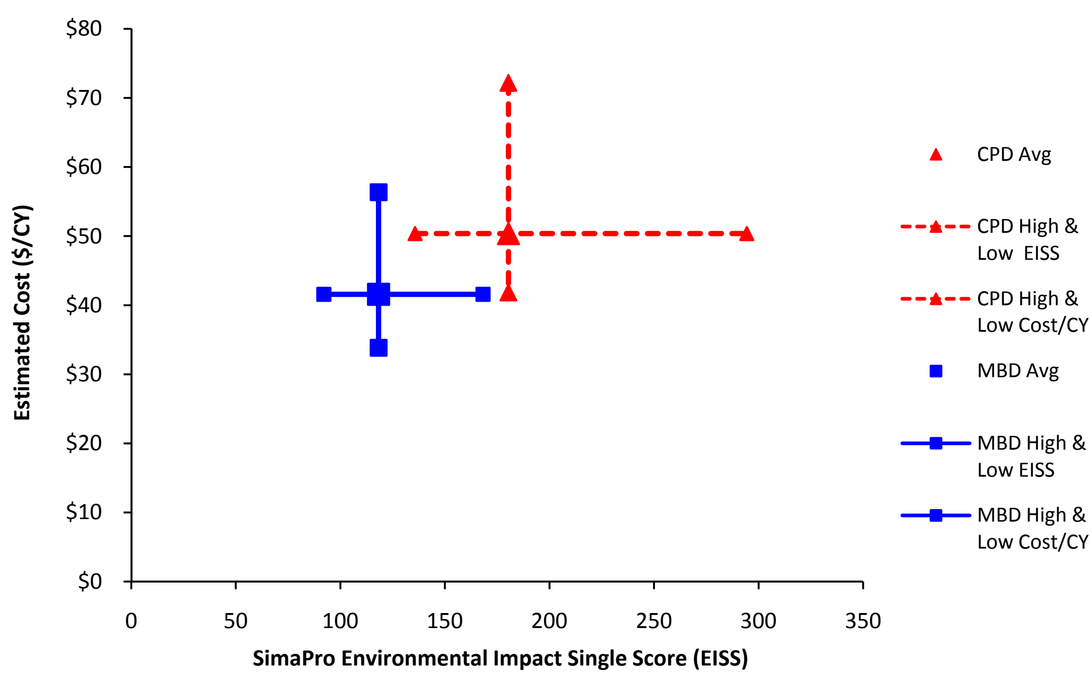

Figure 4.4: EISS vs. Cost – 1,000 CY and 16,000 ft

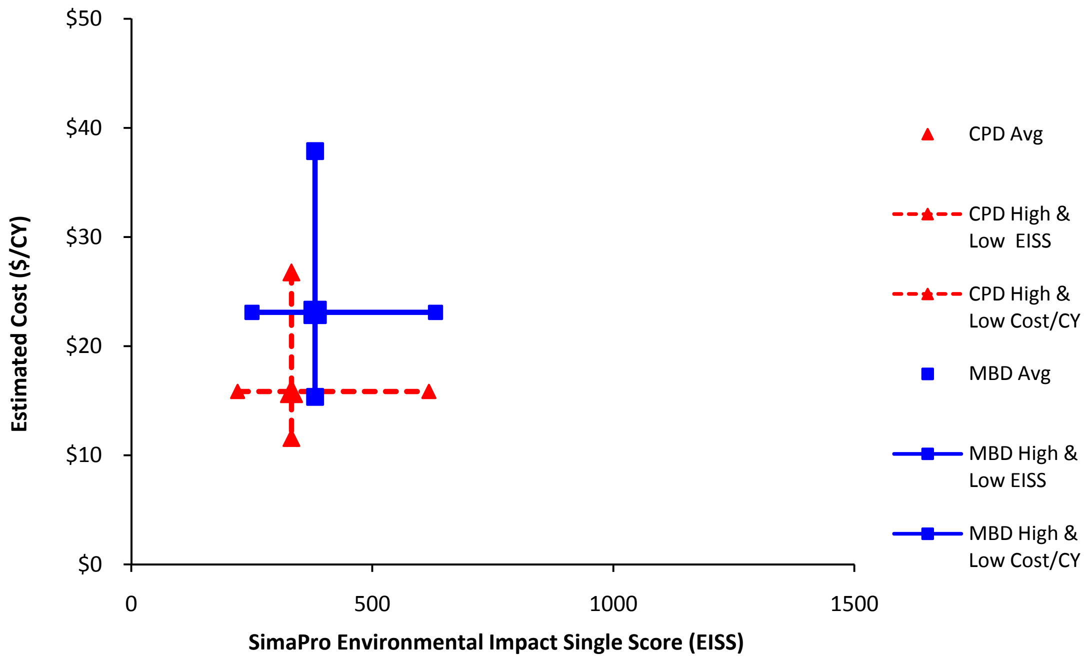

Figure 4.5: EISS vs. Cost – 5,000 CY and 8,000 ft

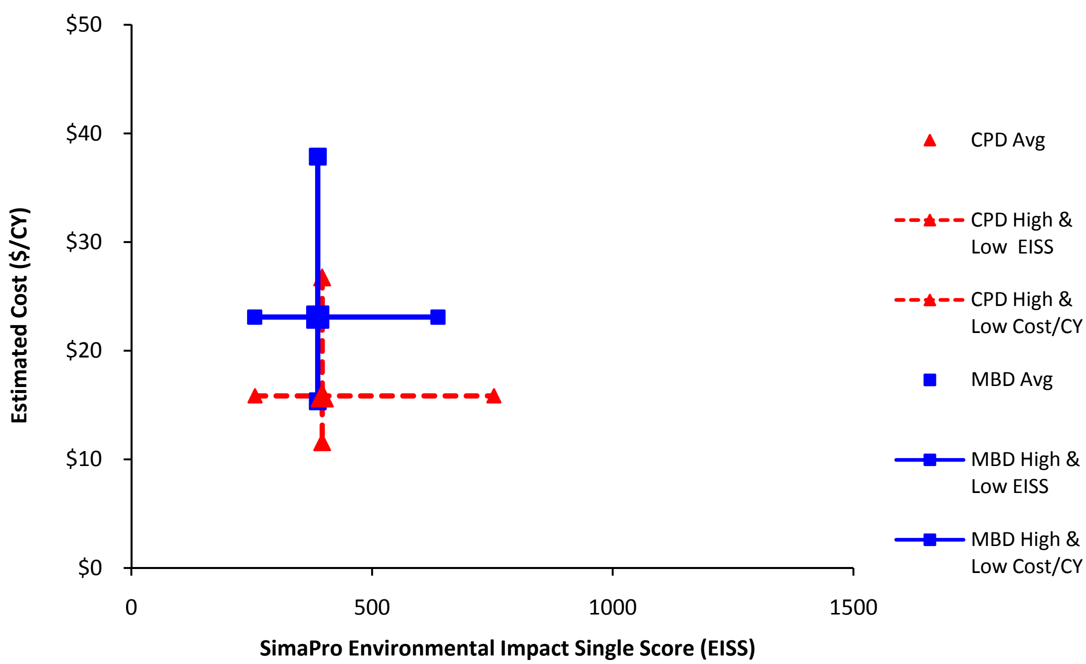

Figure 4.6: EISS vs. Cost – 5,000 CY and 10,000 ft

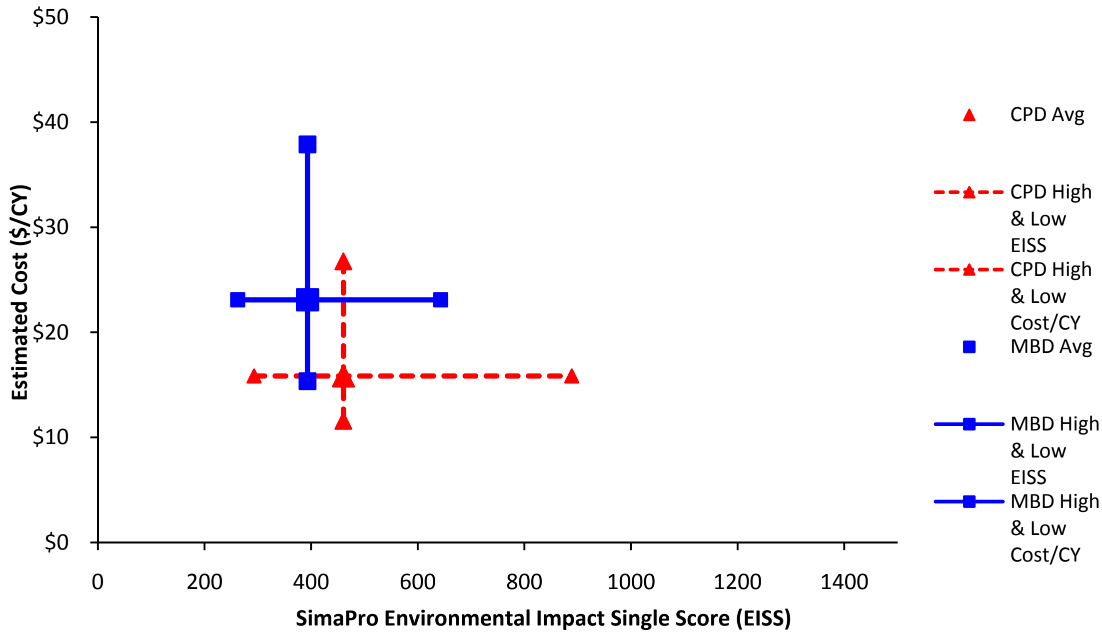

Figure 4.7: EISS vs. Cost – 5,000 CY and 12,000 ft

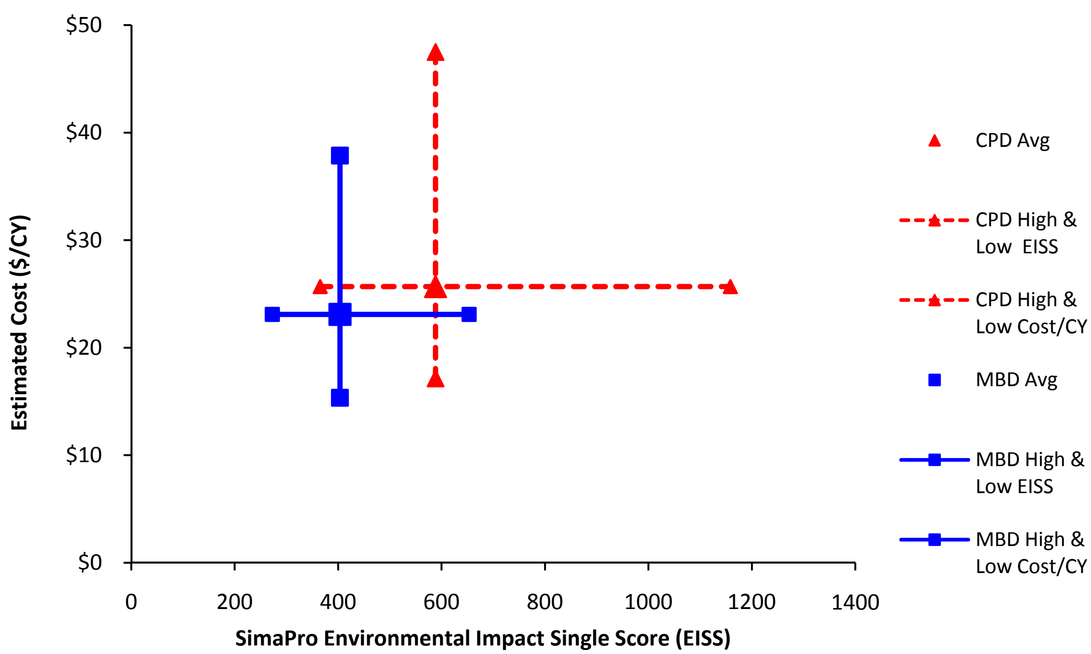

Figure 4.8: EISS vs. Cost – 5,000 CY and 16,000 ft

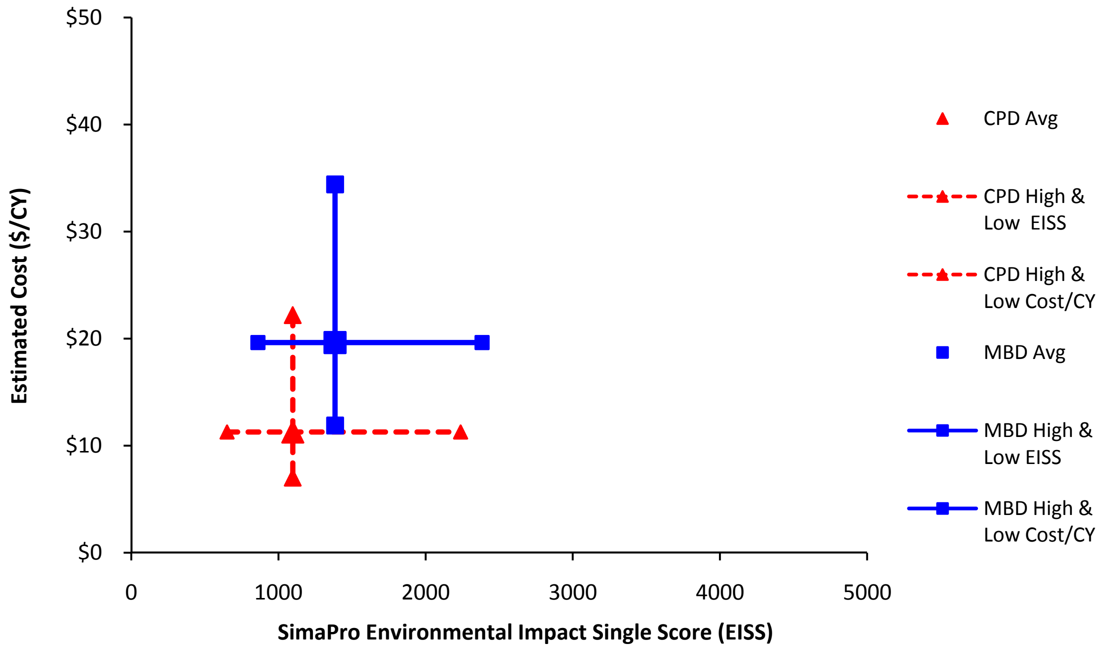

Figure 4.9: EISS vs. Cost – 20,000 CY and 8,000 ft

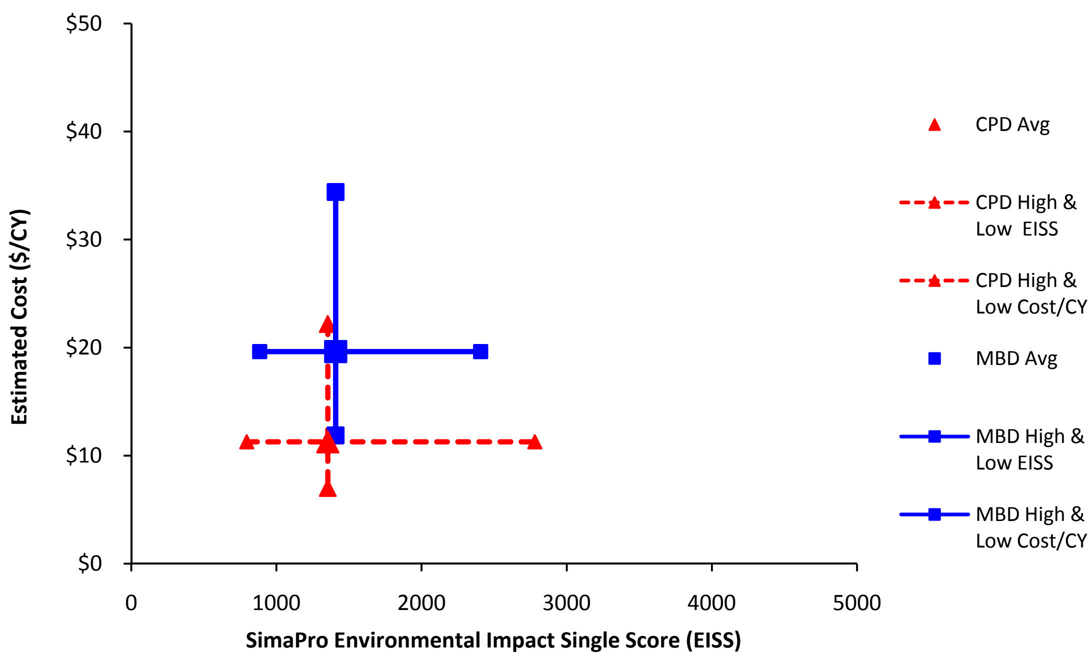

Figure 4.10: EISS vs. Cost – 20,000 CY and 10,000 ft

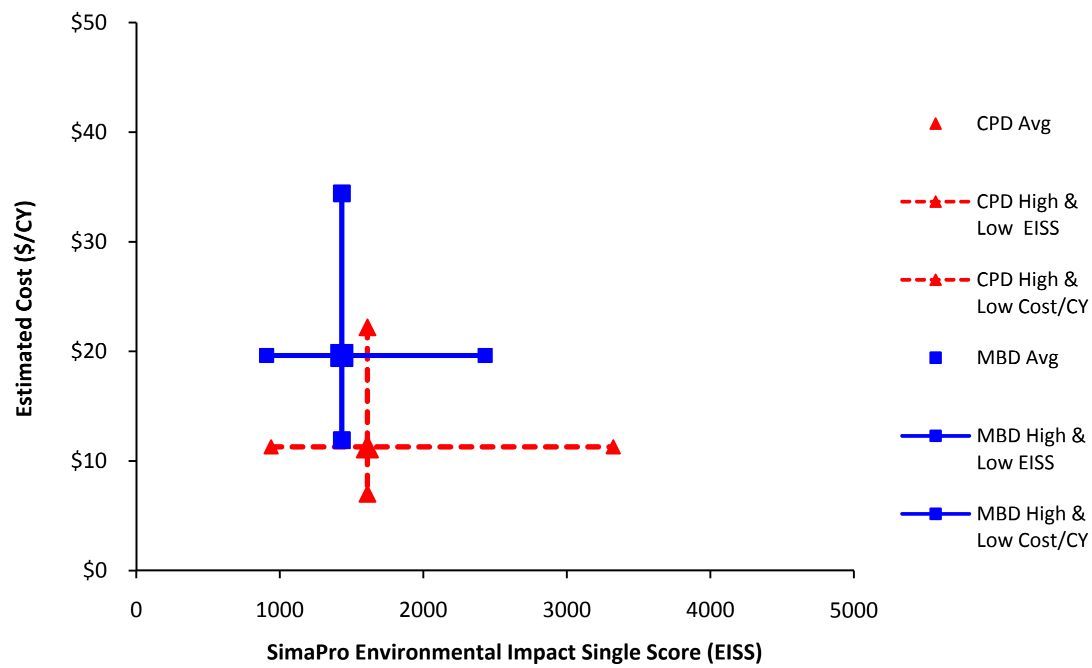

Figure 4.11: EISS vs. Cost – 20,000 CY and 12,000 ft

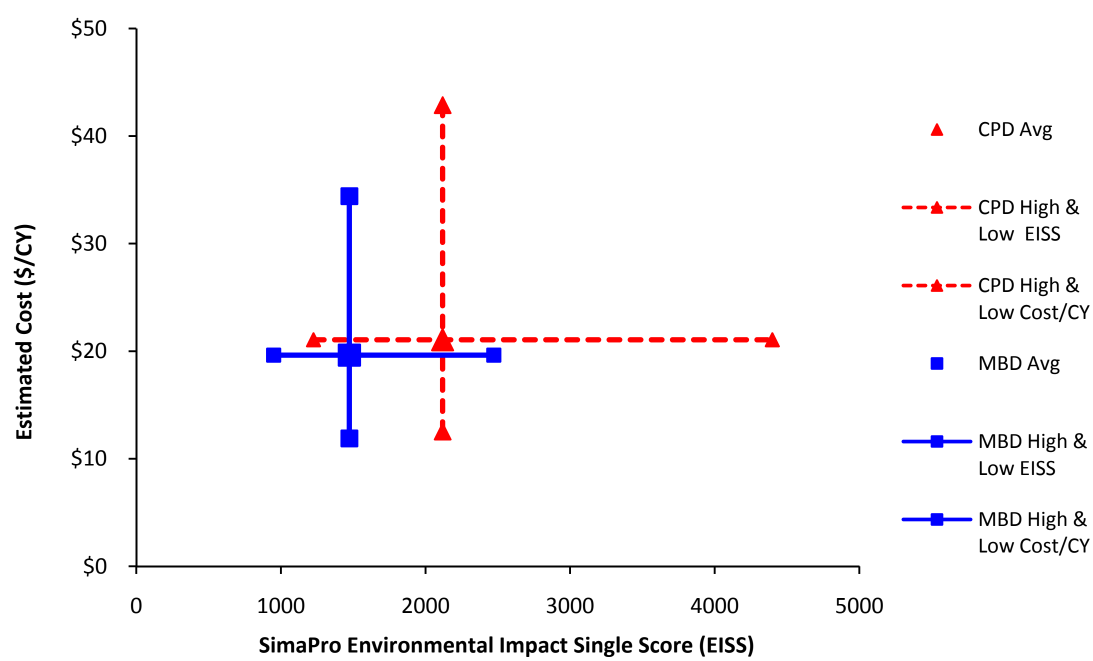

Figure 4.12: EISS vs. Cost – 20,000 CY and 16,000 ft

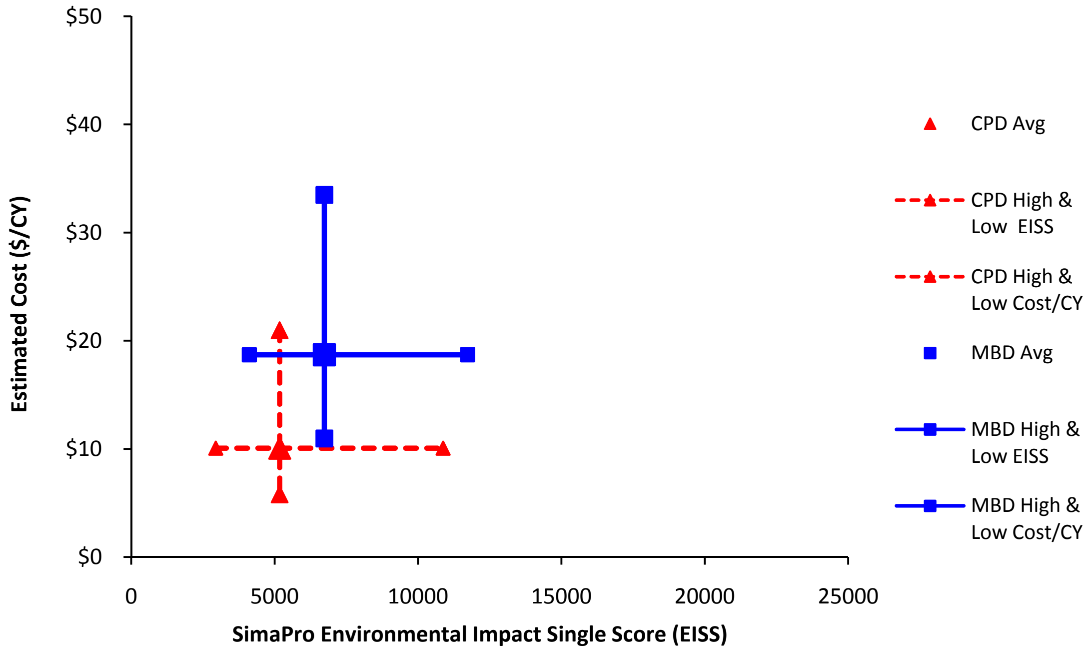

Figure 4.13: EISS vs. Cost – 100,000 CY and 8,000 ft

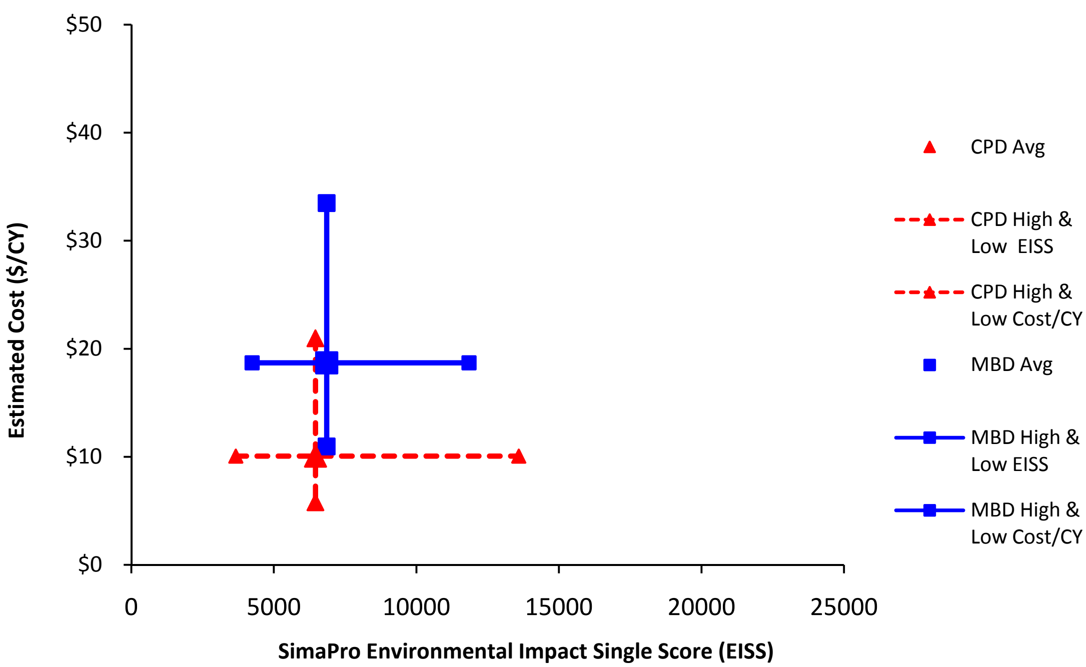

Figure 4.14: EISS vs. Cost – 100,000 CY and 10,000 ft

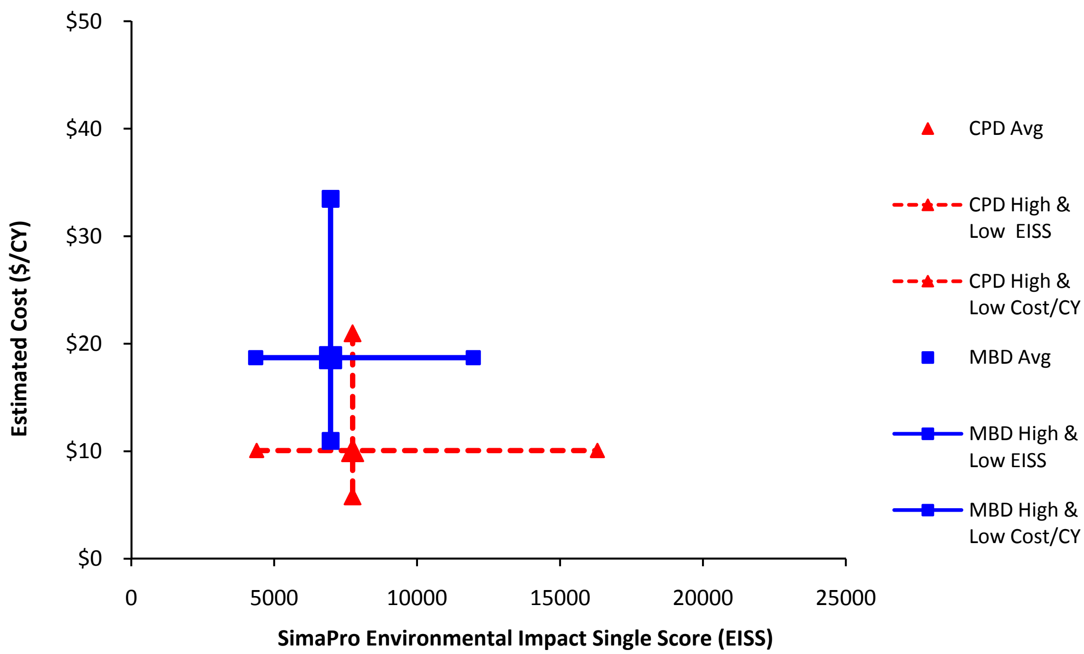

Figure 4.15: EISS vs. Cost – 100,000 CY and 12,000 ft

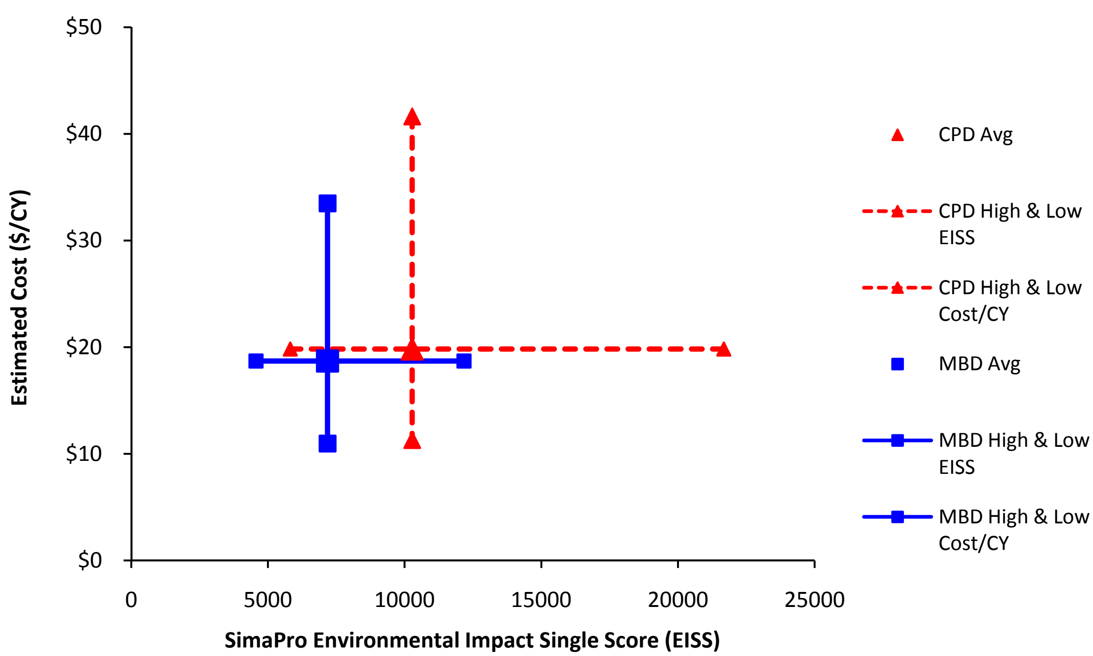

Figure 4.16: EISS vs. Cost – 100,000 CY and 16,000 ft

4.3 EISS and Cost per CY versus Transport Distance

A range of dredged material volumes are the basis for these graphs. For each quantity there are four graphs (Figures 4.17 – 4.32), one that includes all three production rates and then three more, one for each production rate. All of the graphs are formatted the same for continuity. Dashed lines represent the EISS versus transport distance while the solid lines are for the cost per CY versus transport distance. The solid markers indicate the cutterhead pipeline dredge and the open markers signify the mechanical bucket dredge. The production rates are indicated by the shape of the markers, square for the low production rate, diamond markers for the average production rate, and triangular for the high production rate. Colors are distinctive and consistent throughout the graphs with each combination of dredge type, production rate, and cost or EISS have its own color of line and marker. The scales are consistent for each volume of dredged material but do change as the volume increases, similar to the EISS versus cost per CY graphs. The "all production rate" graphs show how a dredge's rate of production impacts the EISS and cost per CY across all transport distances considered. If, however, the rate of production for both the cutterhead pipeline and mechanical bucket dredges are known then a graph focusing on only one production rate is cleaner and easier to read. This graph illustrates how the EISS and cost for both dredge crews compares as transport distances increase. Decision-makers can then easily see and select the type of dredge that will have the lowest adverse impacts to air quality and cost per CY for a specific dredging project.

4.3.1 *1,000 CY of Dredged Material*

For a small volume of dredged material, such as the 1,000 CY scenario, and a high production rate (Figure 4.18) clearly shows that the mechanical bucket dredge has a lower EISS and cost per CY across all transport distances. As the production rate decreases to the average level the mechanical bucket dredge continues to have a lower EISS for all distances (Figure 4.19). The cost per CY is slightly lower, but could be considered comparable, for the cutterhead pipeline dredge for all transport distances except where double-handling is required. At the 16,000 foot distance the mechanical bucket dredge has a lower cost per CY. A low production rate yields similar results to the average rate with one exception (Figure 4.20). The difference in cost per CY for 8,000, 10,000, and 12,000 foot transport distances is greater and could no longer be considered comparable. For these three distances the cutterhead pipeline dredge has a lower cost per CY.

At a high production rate the mechanical bucket dredge would clearly be the better choice from both an air quality and economic perspective for all transport distances (Figure 4.18). The mechanical bucket dredge would have lower adverse impacts to air quality for the average production rate with a comparable to lower cost per CY depending on the transport distance, making it preferable over the cutterhead pipeline dredge (Figure 4.19). At a low production rate the decision-maker would have to make a choice between lower EISS or cost for all transport distances except 16,000 feet where the mechanical bucket dredge yields lower air emissions at a lower cost per CY (Figure 4.20).

4.3.2 *5,000 CY of Dredged Material*

When the quantity of dredged material is increased to 5,000 CY some of the decision points become a little less clearly defined. At the high production rate the cutterhead pipeline dredge has an advantage over the mechanical bucket dredge in the cost per CY for transport distance less than or equal to 12,000 feet (Figure 4.22). This reverses at 16,000 feet with the mechanical bucket dredge having a lower cost. The EISS for the cutterhead pipeline dredge is lower at 8,000 feet and is comparable between the two dredge types at 10,000 feet (Figure 4.22). The cutterhead pipeline dredge EISS increases as the transport distance extends while the mechanical bucket dredge has an almost constant EISS resulting in a lower EISS for the mechanical bucket dredge at 12,000 and 16,000 feet (Figure 4.22). When an average production rate is considered the mechanical bucket dredge has a slightly higher EISS at 8,000 feet transitioning to slightly lower at 10,000 feet and increasingly lower as the transport distance increases to 16,000 feet (Figure 4.23). The cost per CY is similar to the high production rate with the advantage in favor of the cutterhead pipeline dredge for all transport distances except 16,000 feet. At a low production rate the cutterhead pipeline dredge has a slightly lower EISS at 8,000 feet increasing to a higher level at 10,000, 12,000, and 16,000 feet (Figure 4.24). The costs per CY results are similar to the average production rate but the differences are more pronounced (Figures 4.23 and 4.24).

The cutterhead pipeline dredge would be the better choice at a short transport distance and also at 10,000 feet with a high production rate due to a lower cost and comparable EISS (Figures 4.22, 4.23 and 4.24). However, at the intermediate transport distances of 10,000 and 12,000 feet a decision-maker would have a choice to make between lower costs or lower EISS regardless of the production rate, except for 10,000 feet at a high production rate, with the difference for both EISS and cost increasing between dredge types as the production rate decreases. When double-handling of the dredged material is required the mechanical bucket dredge has lower EISS and cost per CY at all production rates making it clearly the better choice (Figures 4.22, 4.23 and 4.24).

4.3.3 *20,000 CY of Dredged Material*

Increasing the volume of dredged material to 20,000 CY results in very little change in the decision points over the 5,000 CY volume values (Figures 4.26, 4.27 and 4.28). At a high production rate with 8,000 and 10,000 foot transport distances the cutterhead pipeline dredge has a lower EISS and cost per CY (Figure 4.26). The cost advantage continues for the cutterhead pipeline dredge at the 12,000 foot distance while the EISS is slightly higher at 12,000 feet. The mechanical bucket dredge has a lower EISS and slightly lower cost per CY when a 16,000 foot distance is considered. The two types of dredges compare similarly when moving from a high to an average production rate (Figures 4.26 and 4.27). The low production rate results in a slightly lower EISS at 8,000 feet for the cutterhead pipeline dredge but the mechanical bucket dredge has an increasing advantage once the transport distance reaches 10,000 feet and greater (Figure

4.28). The cost per CY is lower for the cutterhead pipeline dredge for distances less than or equal to 12,000 feet but the mechanical bucket dredge has a lower cost at 16,000 feet.

The cutterhead pipeline dredge would be the logical choice for short transport distances across all production rates and also at 10,000 feet for average and high production rates (Figures 4.26, 4.27 and 4.28). However, low production rates at 10,000 feet and all production rates at 12,000 feet would require a choice between lower impacts to air quality or lower costs (Figures 4.26, 4.27 and 4.28). As with the smaller quantities of dredged material selecting the mechanical bucket dredge would result in lower environmental impacts and costs for the 16,000 foot transport distance at all production rates (Figures 4.26, 4.27 and 4.28).

4.3.4 *100,000 CY of Dredged Material*

For a large volume of dredged material such as the 100,000 CY used in this study the mechanical bucket dredge has a lower EISS for the 12,000 and 16,000 foot transport distances at all production rates except for 12,000 feet with a high production rate where both dredges have a comparable EISS (Figures 4.30, 4.31 and 4.32). At 10,000 feet the mechanical bucket dredge EISS ranges from slightly higher than a cutterhead pipeline dredge for a high production rate to lower at the low rate. The cutterhead pipeline dredge has a lower EISS for all production rates at an 8,000 foot transport distance. The cost per CY for the cutterhead pipeline dredge is lower for all production rates at 8,000 to 12,000 feet and comparable to higher at 16,000 feet.

Selection of the cutterhead pipeline dredge for an 8,000 foot transport distance at all production rates would result in lower air emissions and cost per CY (Figures 4.30, 4.31 and 4.32). At 10,000 feet the cutterhead pipeline dredge has a lower EISS and cost for average and high production rates, making it the logical choice (Figures 4.30 and 4.31). The cutterhead pipeline dredge has a comparable EISS and lower cost per CY at 12,000 feet with a high production rate (Figure 4.30). If a low production rate is being considered then a choice would need to be made between lower air emissions and cost at both the 10,000 and 12,000 foot distances (Figure 4.32). A similar choice would be necessary at 12,000 feet for with an average production rate (Figure 4.31). In the case of a 16,000 foot transport distance the mechanical bucket dredge would have both a lower EISS and cost per CY for all production rates (Figures 4.30, 4.31 and 4.32).

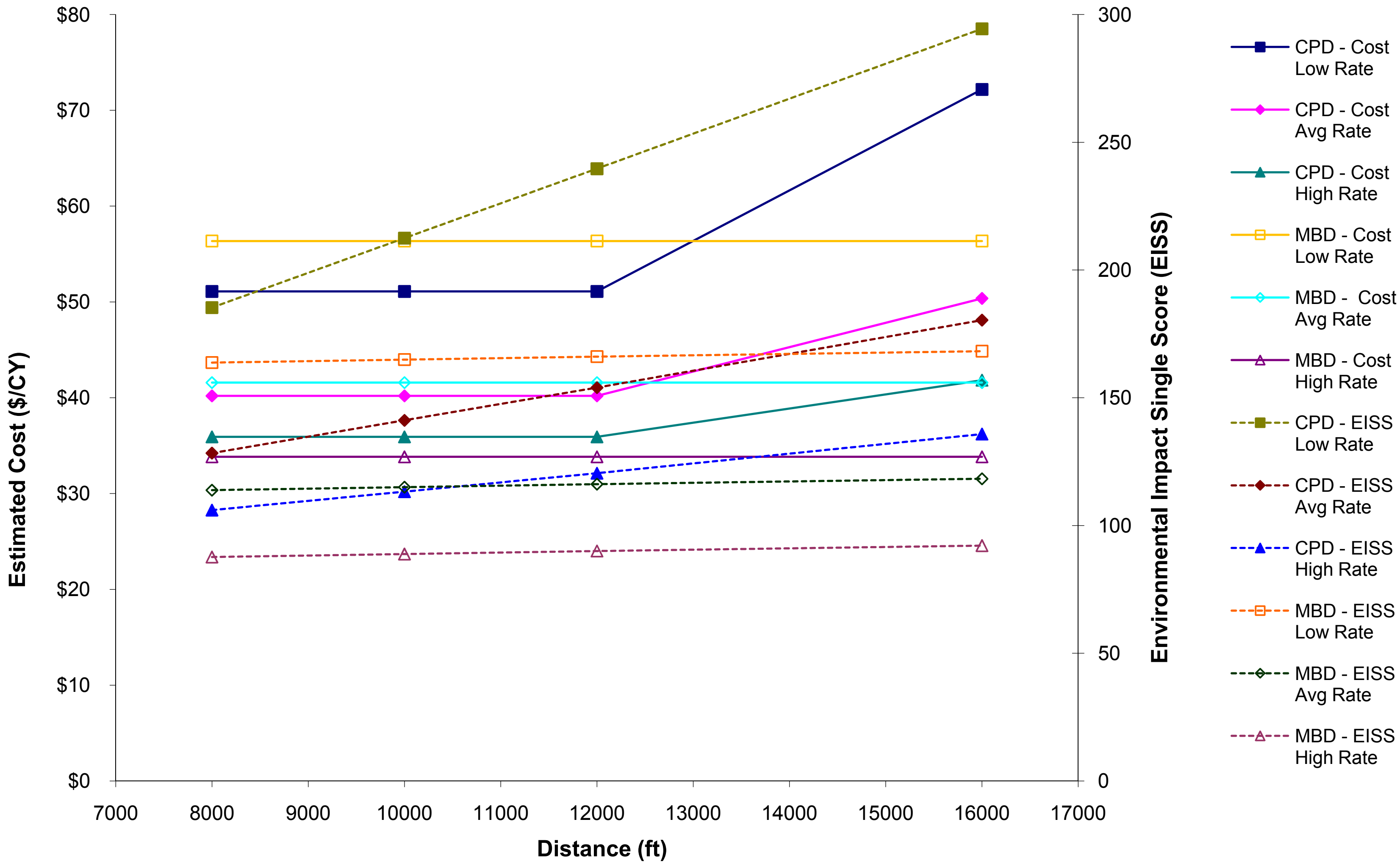

Figure 4.17: EISS and Cost vs. Transport Distance: 1,000 CY – All Production Rates

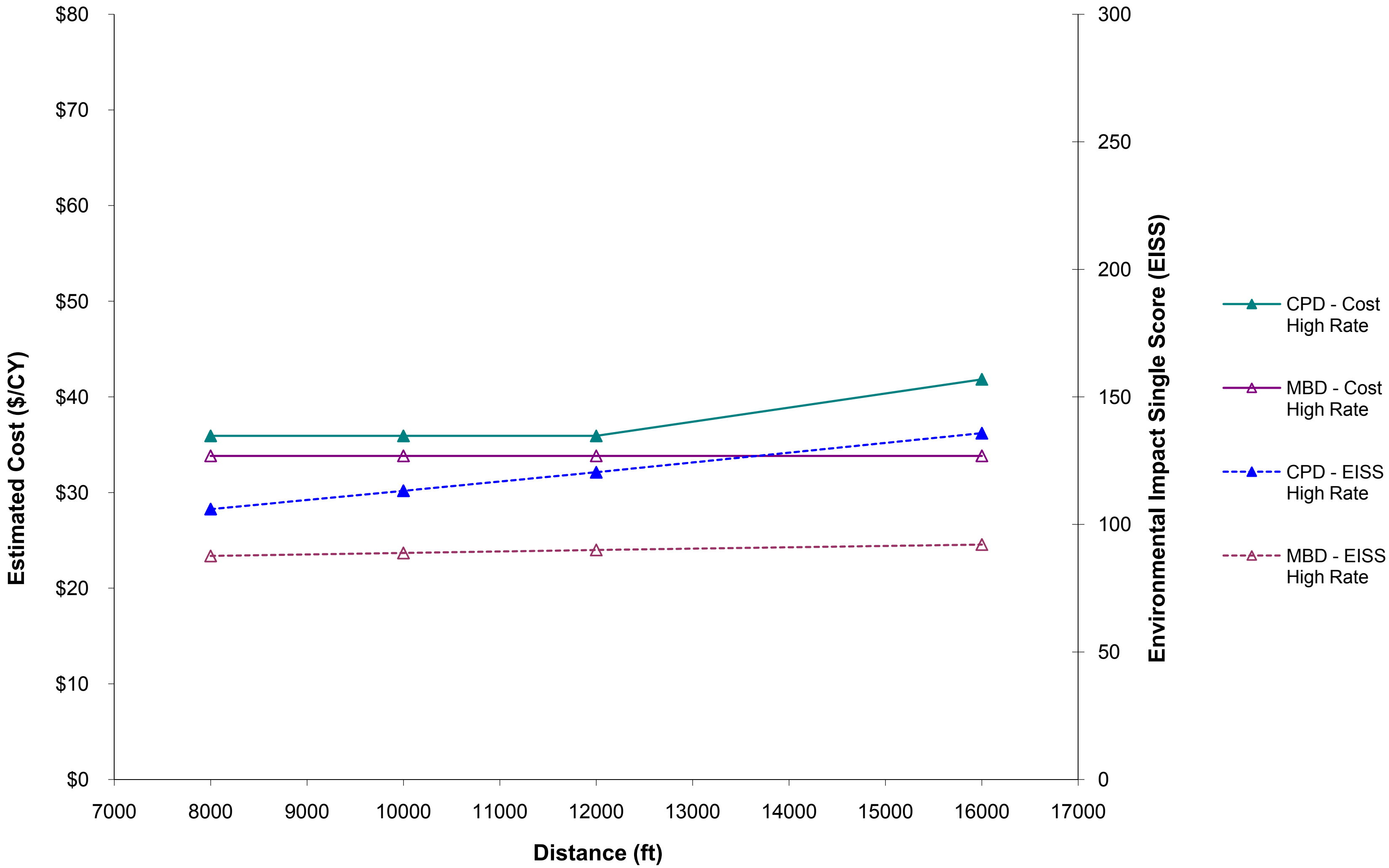

Figure 4.18: EISS and Cost vs. Transport Distance: 1,000 CY – High Production Rate

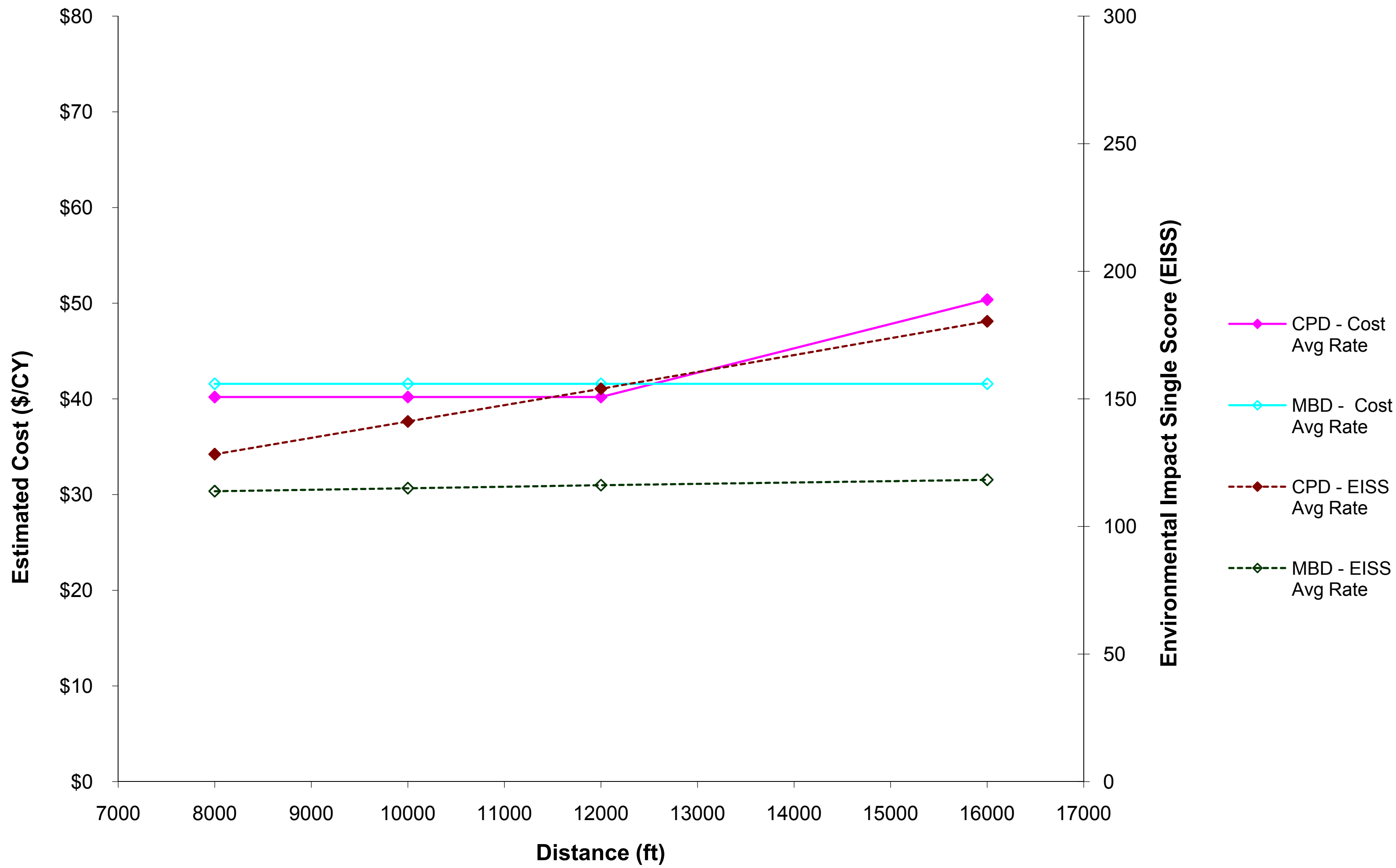

Figure 4.19: EISS and Cost vs. Transport Distance: 1,000 CY – Average Production Rate

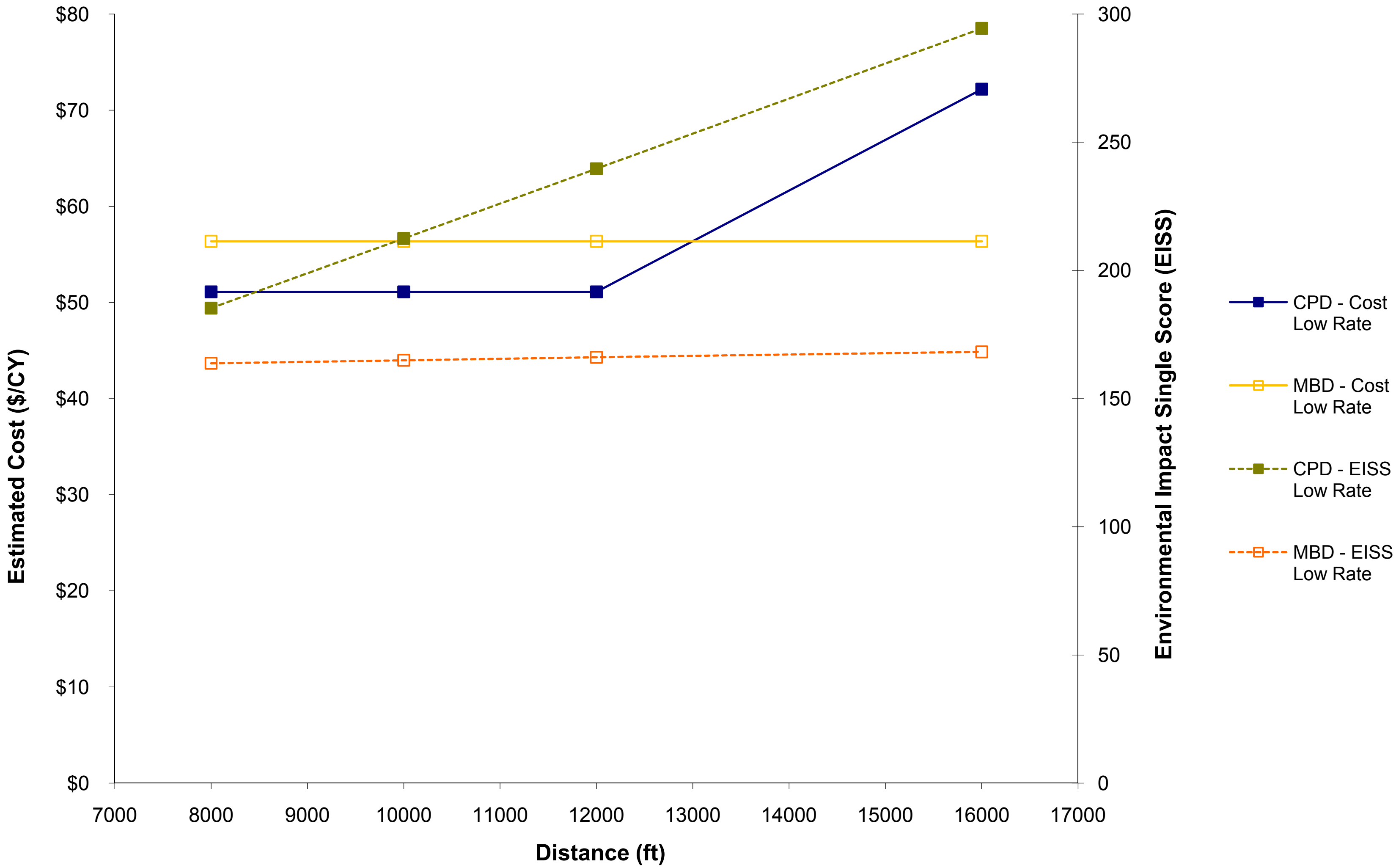

Figure 4.20: EISS and Cost vs. Transport Distance: 1,000 CY – Low Production Rate

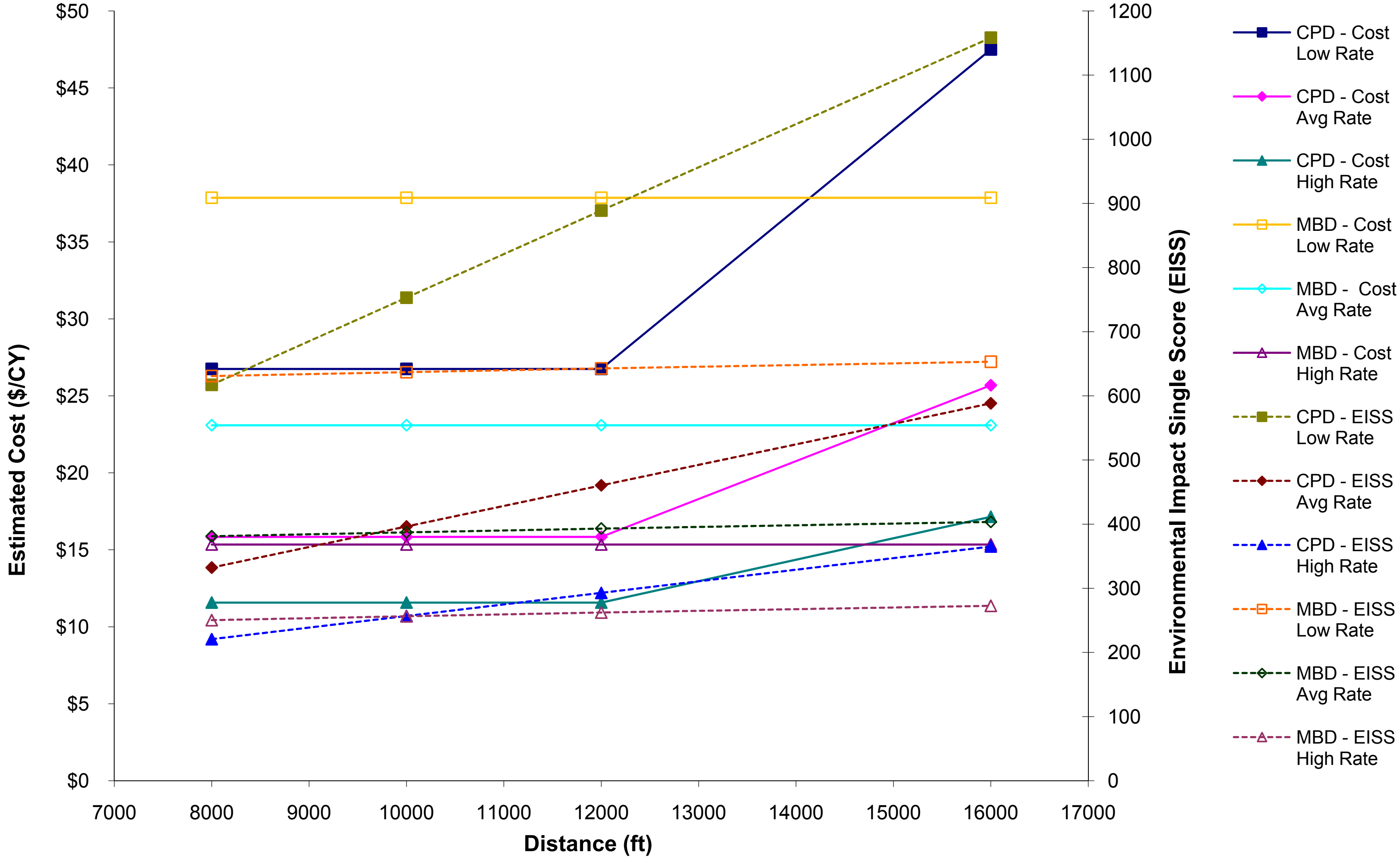

Figure 4.21: EISS and Cost vs. Transport Distance: 5,000 CY – All Production Rates

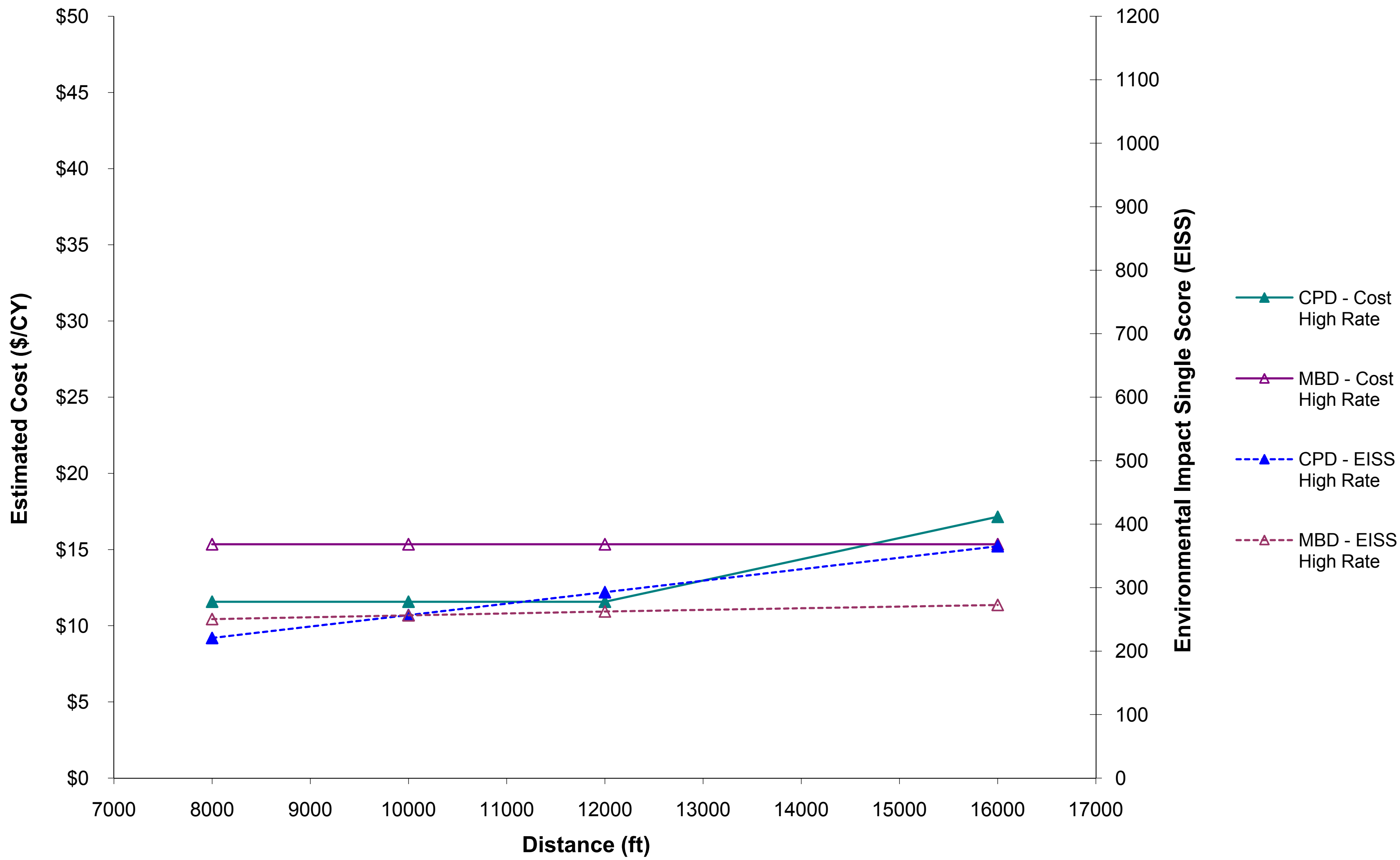

Figure 4.22: EISS and Cost vs. Transport Distance: 5,000 CY – High Production Rate

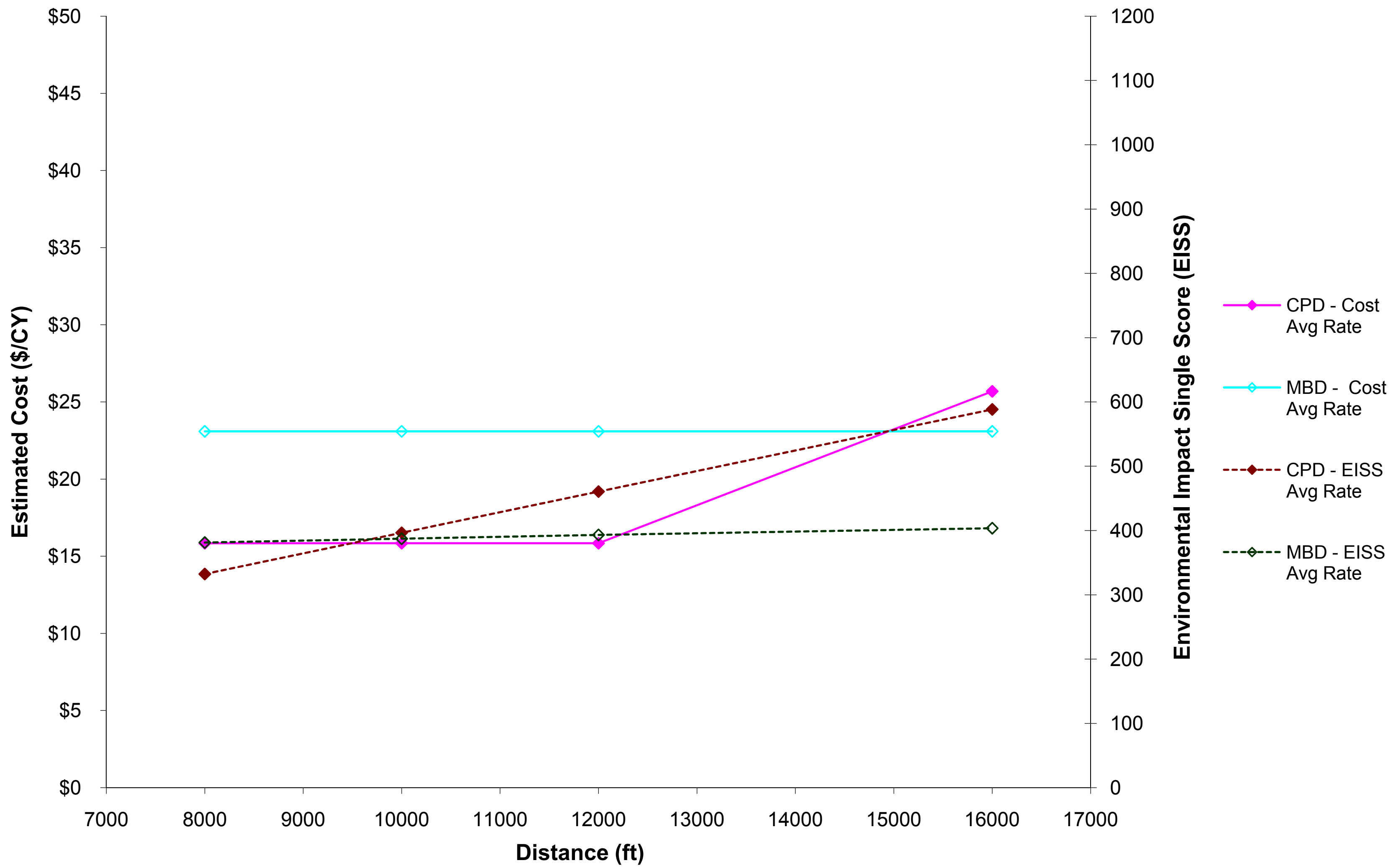

Figure 4.23: EISS and Cost vs. Transport Distance: 5,000 CY – Average Production Rate

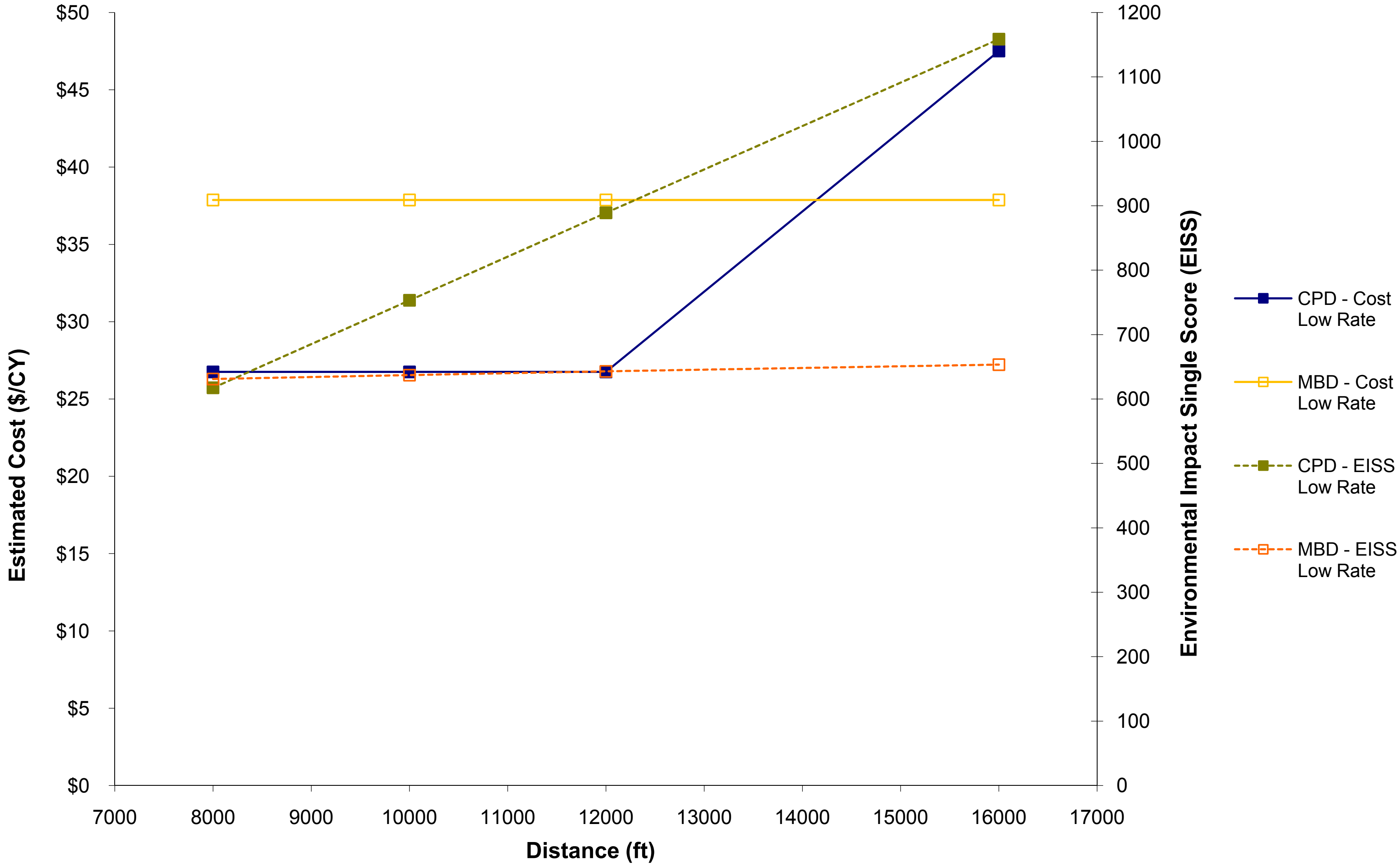

Figure 4.24: EISS and Cost vs. Transport Distance: 5,000 CY – Low Production Rate

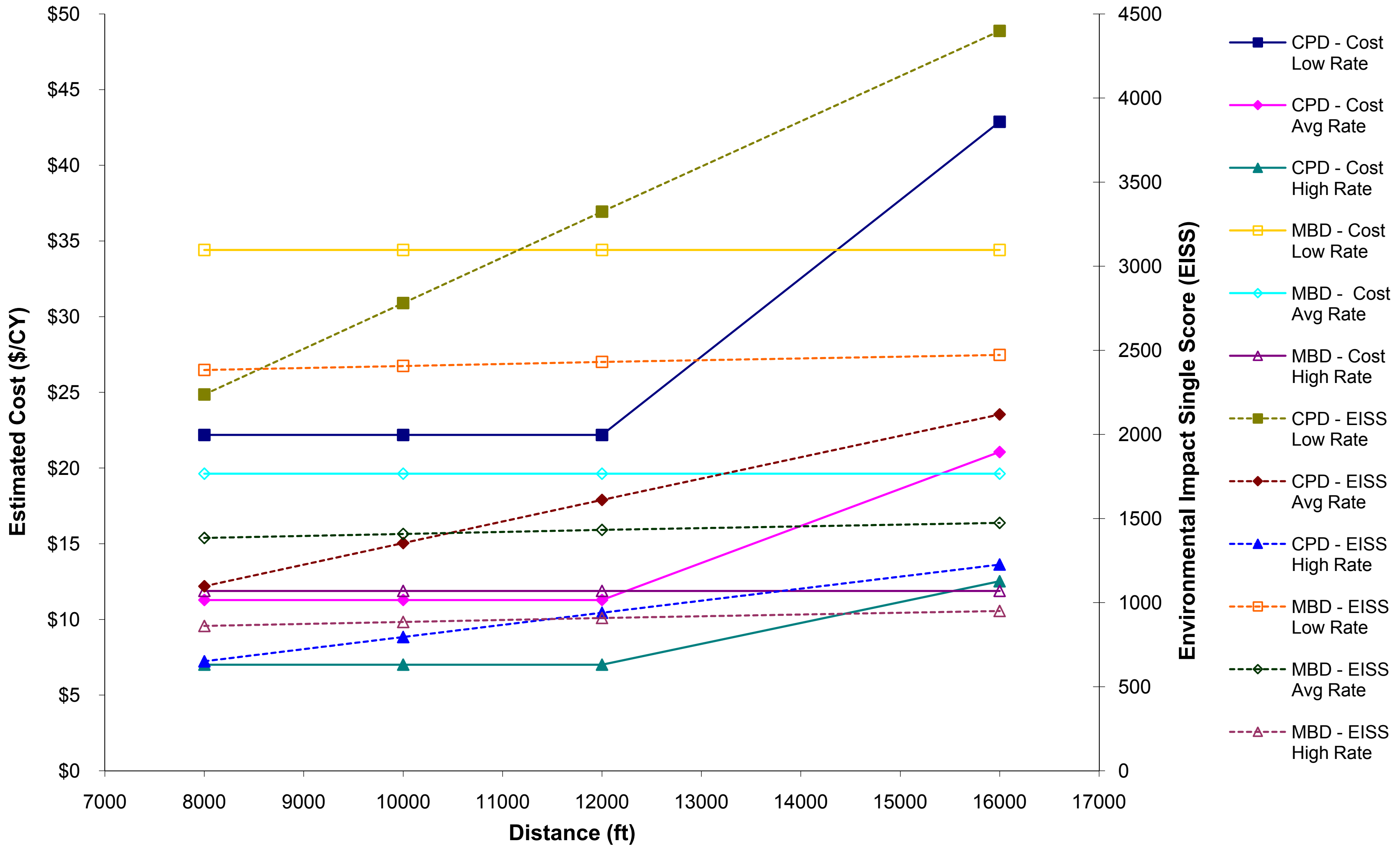

Figure 4.25: EISS and Cost vs. Transport Distance: 20,000 CY – All Production Rates

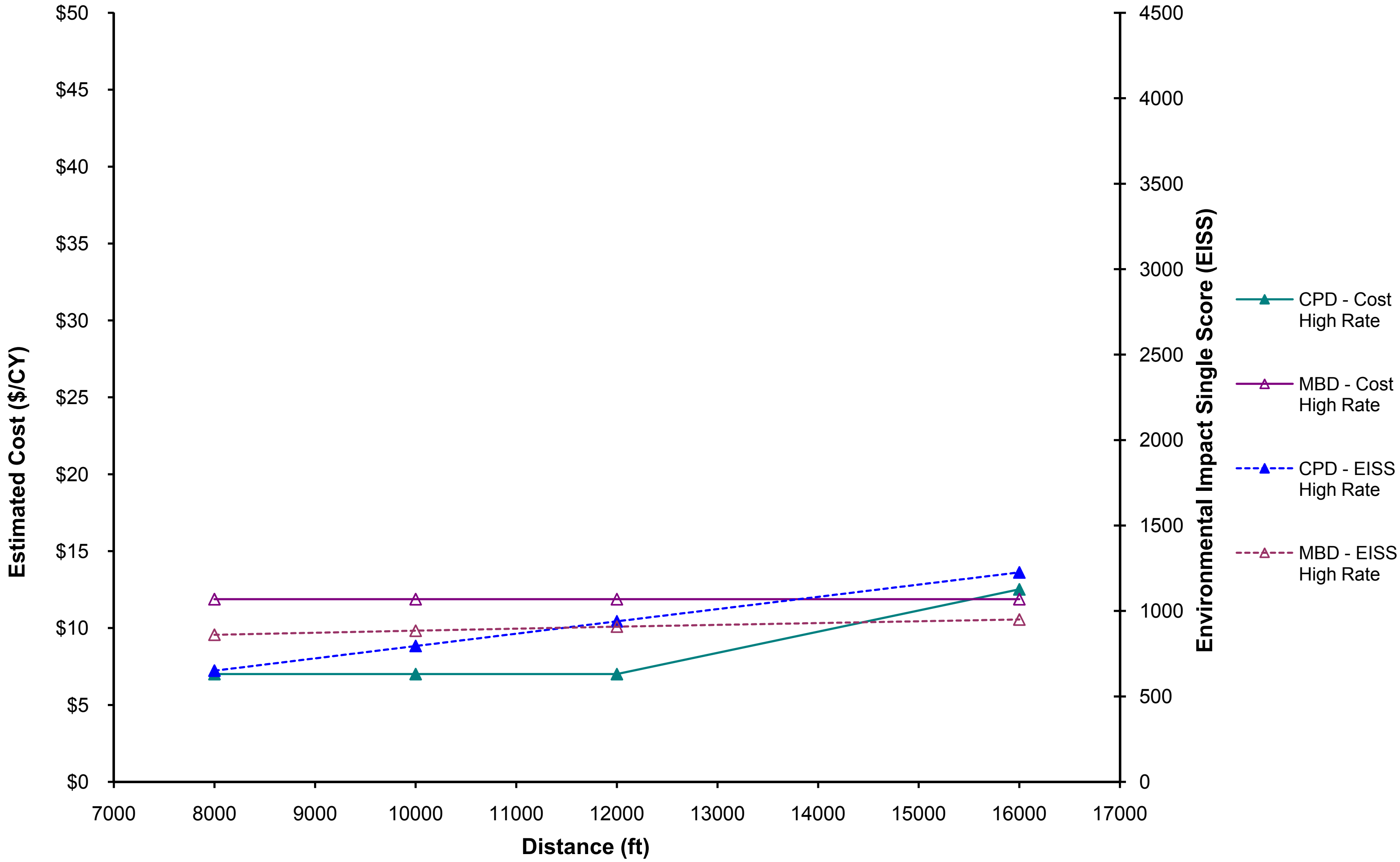

Figure 4.26: EISS and Cost vs. Transport Distance: 20,000 CY – High Production Rate

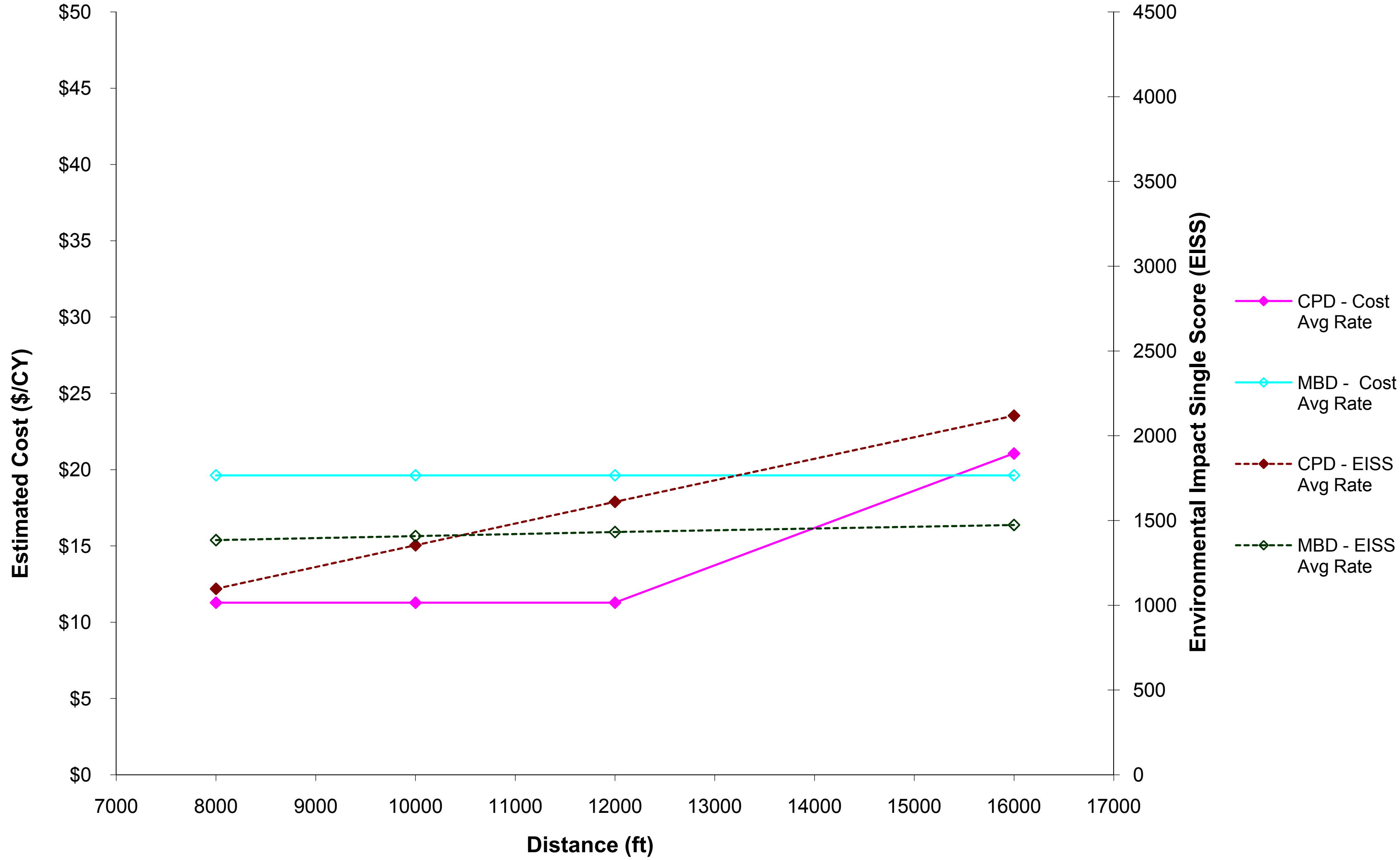

Figure 4.27: EISS and Cost vs. Transport Distance: 20,000 CY – Average Production Rate

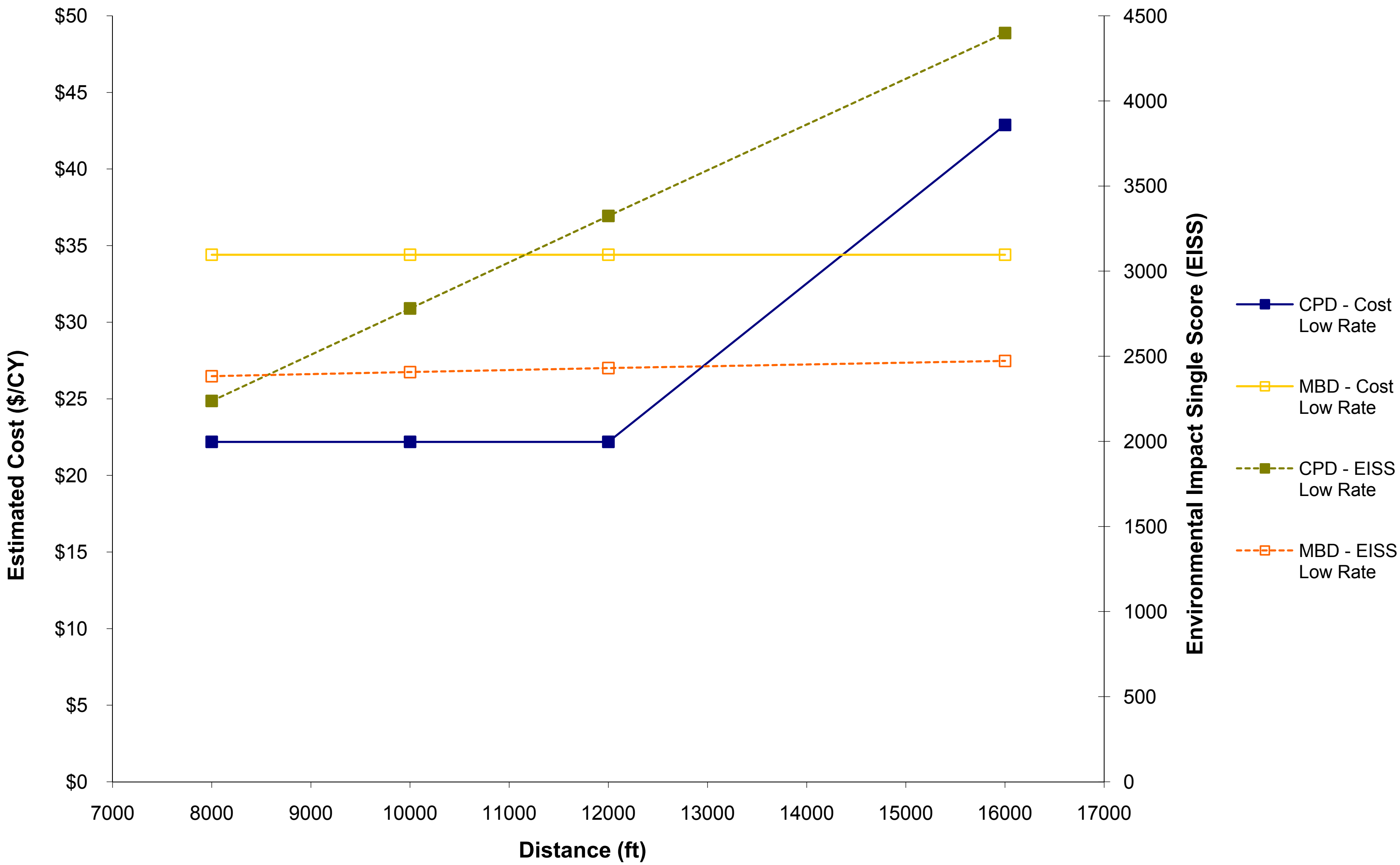

Figure 4.28: EISS and Cost vs. Transport Distance: 20,000 CY – Low Production Rate

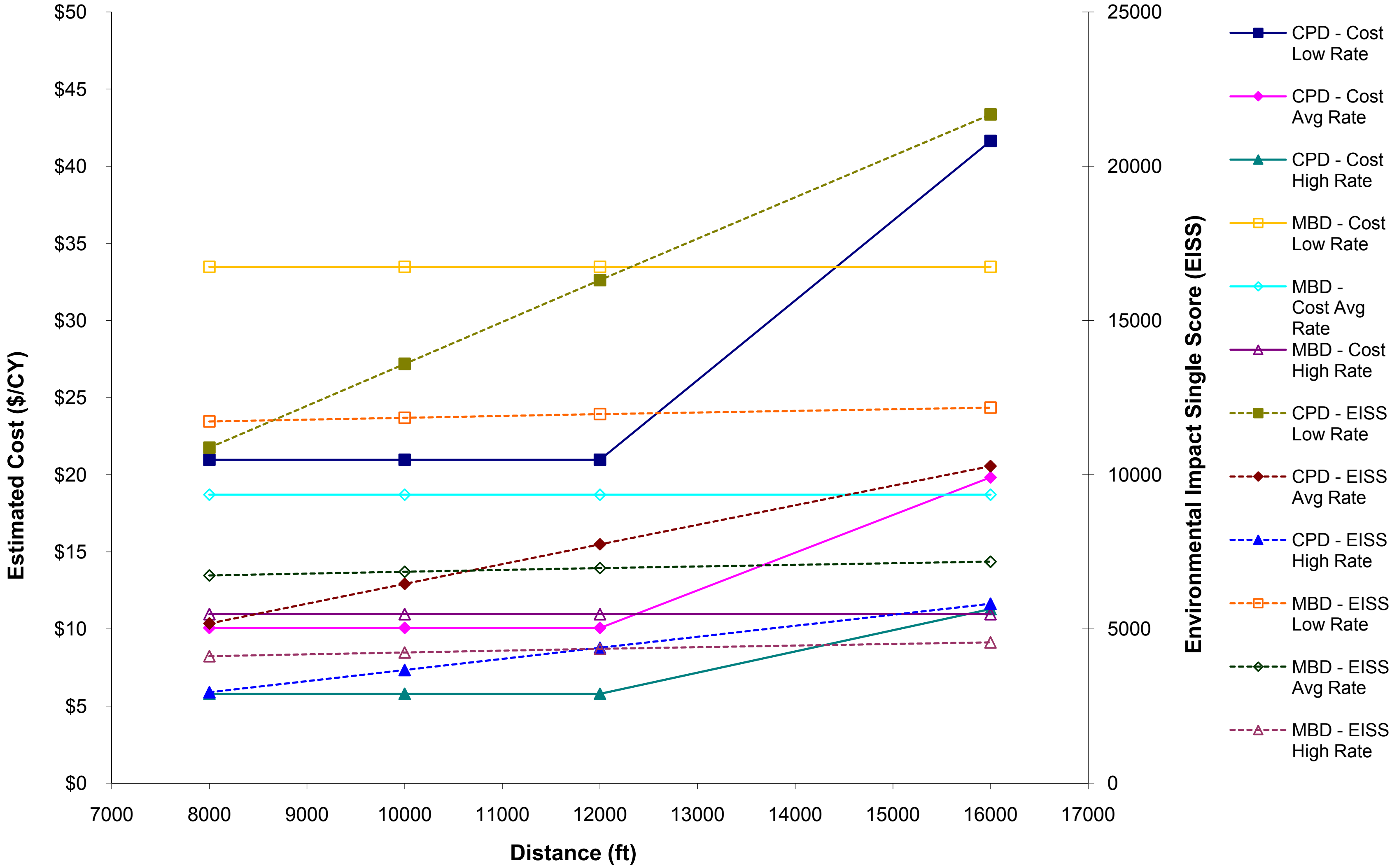

Figure 4.29: EISS and Cost vs. Transport Distance: 100,000 CY – All Production Rates

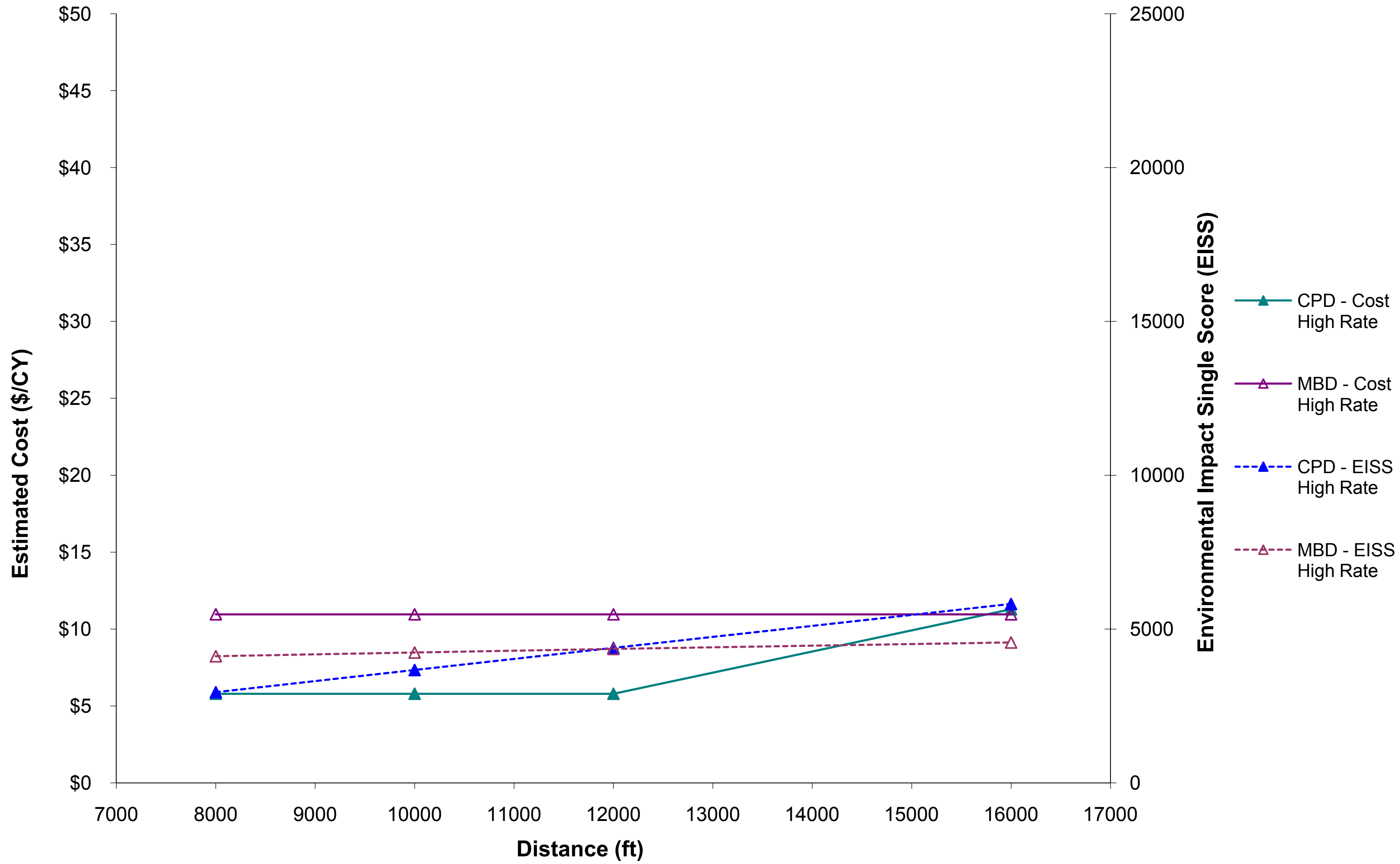

Figure 4.30: EISS and Cost vs. Transport Distance: 100,000 CY – High Production Rate

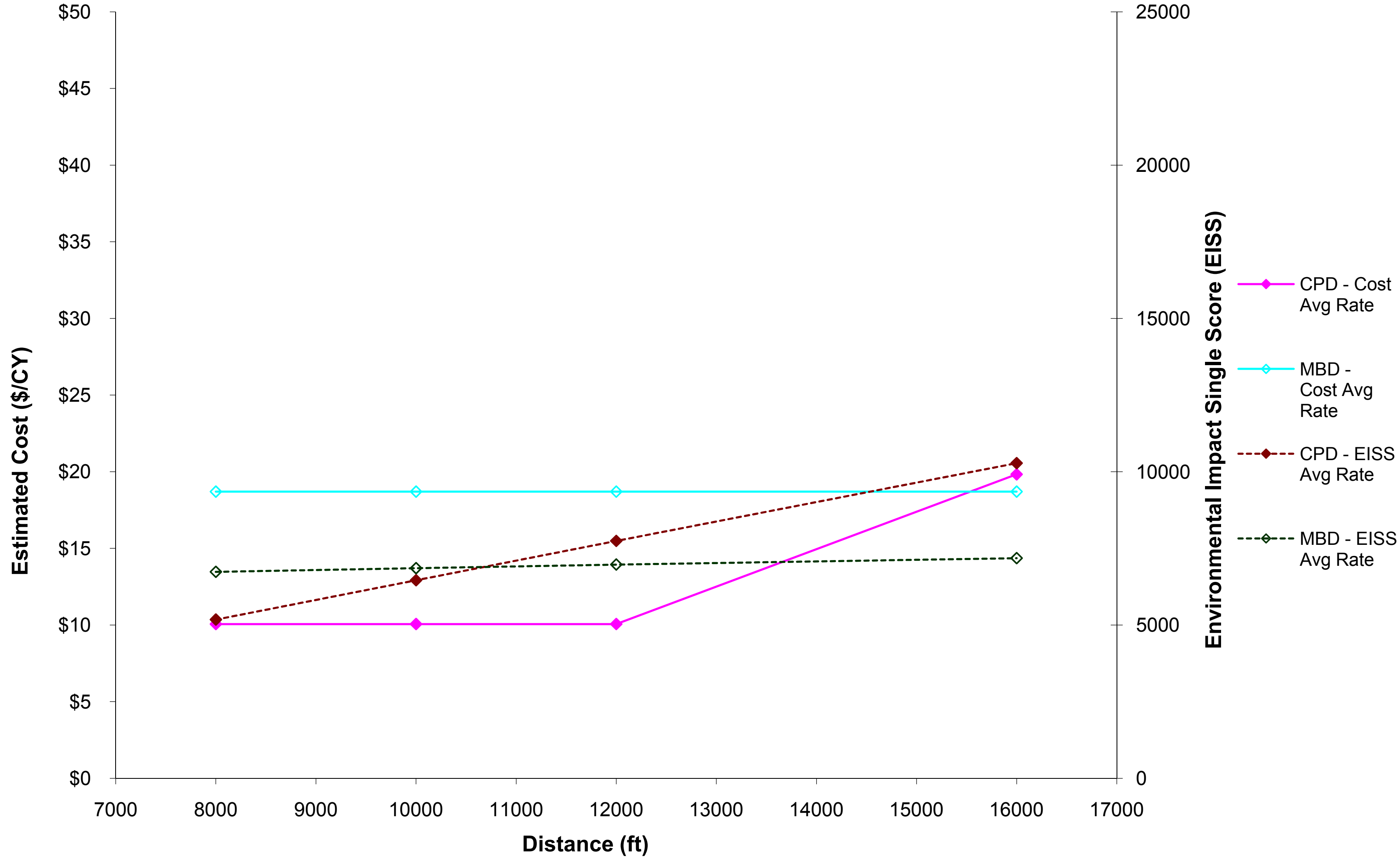

Figure 4.31: EISS and Cost vs. Transport Distance: 100,000 CY – Average Production Rate

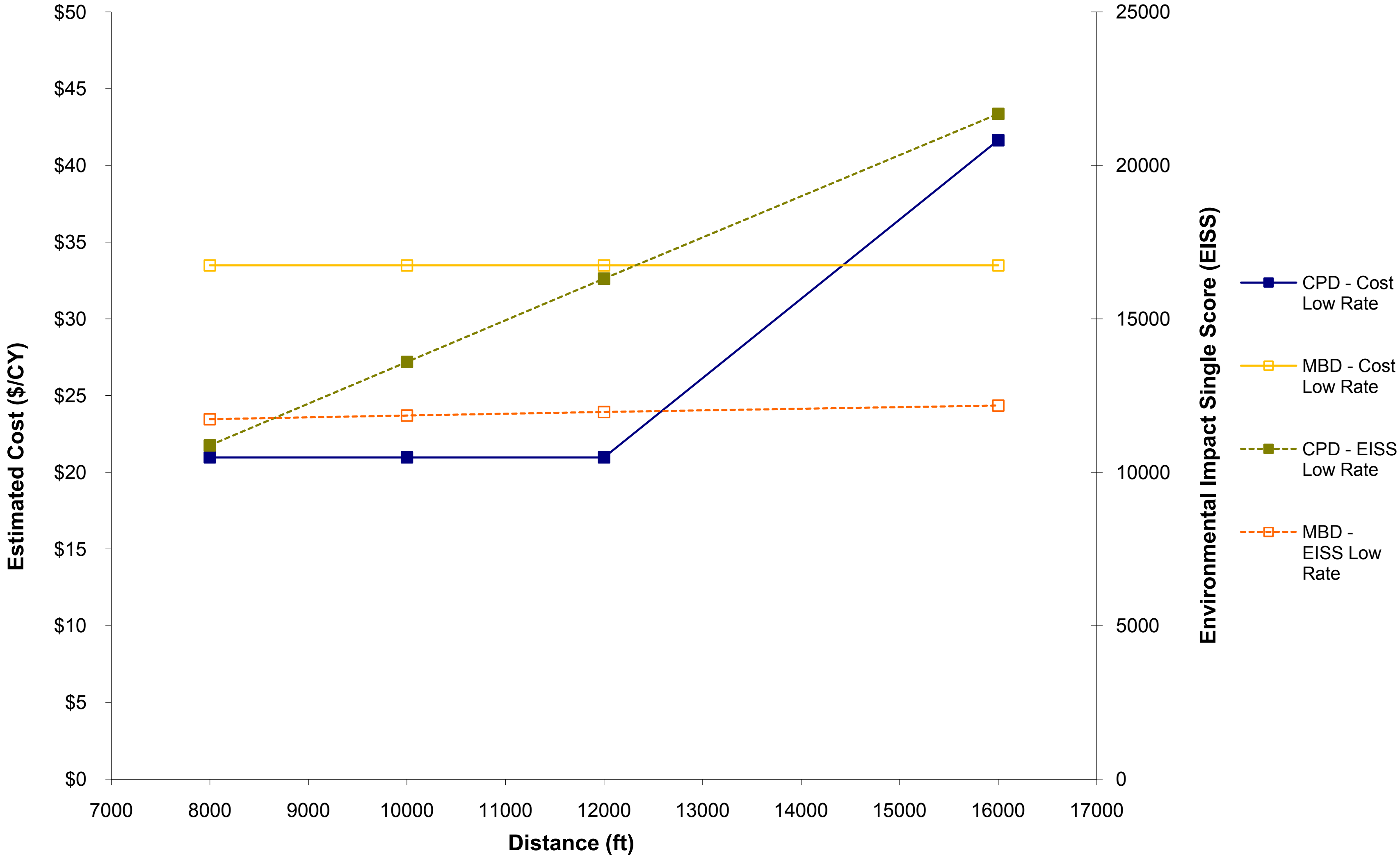

Figure 4.32: EISS and Cost vs. Transport Distance: 100,000 CY – Low Production Rate

4.4 Tradeoff Index

The values of the Tradeoff Index, *I* are seen in Table 4.3. It can be seen that the selection of a cutterhead pipeline dredge would be preferable for moderate and large volumes of dredged material when no additional booster pumps are required, in this study that includes transport distances less than or equal to 8,000 feet. The addition of one booster pump changes the results to be more dependent on the production rate for transport distances greater than or equal to 12,000 feet with no clear choice for 5,000 CY at all production rates. Increasing the number of booster pumps to two yields “No Clear Choice” across all production rates (Table 4.3).

The production rate has a definite impact on the results. In five of 16 scenarios, or approximately 31 percent, changing the production rate altered the determination from “No Clear Choice” to one of the dredging crews having a lower EISS and cost (Table 4.3). This indicates that the expected production rates are significant factors when evaluating the air emissions from comparable dredging equipment.

Table 4.3: Dredging Equipment Selection Summary

(High values of *I* indicate a large change in EISS for a small change in cost)

		Dredged Material Volume							
		1,000 CY		5,000 CY		20,000 CY		100,000 CY	
Transport Distance	**8,000 ft**	*Prod. Rate*	*Results*	*Prod. Rate*	*Results*	*Prod. Rate*	*Results*	*Prod. Rate*	*Results*
		Low	*I=-4*	*Low*	*I=1*	*Low*	*I=12*	*Low*	*I=68*
		Avg	*I=-10*	*Avg*	*I=7*	*Avg*	*I=34*	*Avg*	*I=180*
		High	*I=9*	*High*	*I=8*	*High*	*I=43*	*High*	*I=227*
	10,000 ft	*Prod. Rate*	*Results*	*Prod. Rate*	*Results*	*Prod. Rate*	*Results*	*Prod. Rate*	*Results*
		Low	*I=-9*	*Low*	*I=-10*	*Low*	*I=-31*	*Low*	*I=-140*
		Avg	*I=-19*	*Avg*	*I=-1*	*Avg*	*I=7*	*Avg*	*I=46*
		High	*I=12*	*High*	*I=-0.1*	*High*	*I=18*	*High*	*I=110*
	12,000 ft	*Prod. Rate*	*Results*	*Prod. Rate*	*Results*	*Prod. Rate*	*Results*	*Prod. Rate*	*Results*
		Low	*I=-14*	*Low*	*I=-22*	*Low*	*I=-73*	*Low*	*I=-347*
		Avg	*I=-27*	*Avg*	*I=-9*	*Avg*	*I=-21*	*Avg*	*I=-89*
		High	*I=15*	*High*	*I=-8*	*High*	*I=-6*	*High*	*I=-7*
	16,000 ft	*Prod. Rate*	*Results*	*Prod. Rate*	*Results*	*Prod. Rate*	*Results*	*Prod. Rate*	*Results*
		Low	*I=8*	*Low*	*I=52*	*Low*	*I=227*	*Low*	*I=1,165*
		Avg	*I=7*	*Avg*	*I=71*	*Avg*	*I=450*	*Avg*	*I=2,758*
		High	*I=5*	*High*	*I=51*	*High*	*I=431*	*High*	*I=3,789*

Legend

	Mechanical Bucket Dredge has Lower EISS and Lower Cost per CY
	No Clear Choice
	Cutterhead Pipeline Dredge has Lower EISS and Lower Cost per CY

CHAPTER 5: SUMMARY AND CONCLUSIONS

5.1 Summary

This study is the first to provide a procedure for evaluating emissions to the atmosphere resulting from the combustion of diesel fuel in commonly used types of dredging equipment. Specifically, the equipment included in this study was a 16-inch cutterhead pipeline dredge and a mechanical bucket dredge used during the 2005 dredging season on the Illinois Waterway (IWW) (Graham 2007/08). Both dredging crews included all of the supporting equipment necessary for mobilization, dredging, dredged material transport, and placement site management operations for all possible scenarios in this study (Table 1.1). The procedure outlined in this study is not limited to the equipment used for navigation channel maintenance dredging in the IWW. It can easily be used for comparison of air emissions between dredging equipment for a wide range of applications.

A total of 48 scenarios were analyzed in this study that varied the quantity of material to be dredged, transport distances from the dredge cut to the placement site, and production rates for each type of dredging equipment. The production rates and transport distances used in this study are based on Rock Island District historical records. The range of dredged material volumes, however, was selected by the author to identify transition points between the two types of dredging equipment in this study.

Total fuel consumed was calculated using standard cost estimating practices as defined in the U.S. Army Corps of Engineers Construction Equipment Ownership and Operating Expense Schedule (USACE, 2005). The diesel fuel usage was estimated for all equipment used to mobilize or operate each dredging crew for every scenario (Table 4.2). Each piece of diesel powered equipment was identified for use during the transportation and/or dredging phase of the operation. The time for each dredging crew and phase was estimated based on average travel speeds, distance traveled for mobilization and transport of dredged material, volume of dredged material, delays to allow navigation vessels to pass, delays for managing dredged material at the placement site, and three production rates (low, average, and high). Travel speeds and production rates for each dredging crew were based on Rock Island District historical data (Graham 2007/08).

A Limited Life Cycle Assessment (LCA) was used to evaluate the adverse environmental impacts, specifically the emissions to the atmosphere, resulting from two comparable dredging operations. The primary purpose of this study is to provide dredging decision makers with a tool to help select equipment for each dredging operation that will reduce the negative environmental impacts as defined in this LCA. Since the selection process would be limited to the dredging equipment available within a given region and would not include the purchase or disposal of that equipment this LCA was limited to the "use" phase only.

This study utilized the emissions from diesel fuel combustion in industrial equipment (Table 3.4) (NREL, 2003) to define the constituents and mass emitted per gallon of diesel fuel burned. This data was entered into SimaPro LCA software as a process then applied to each of the scenarios (Table 5.1) yielding the environmental impacts for each quantity dredged, transport distance, and production rate.

Table 5.1: Scenarios Included in this Study
("Low", "Avg", and "High" refer to production rates)

		Dredged Material Volume (CY)											
		1,000			5,000			20,000			100,000		
Transport Distance (ft)	8,000	*Low*	*Avg*	*High*	*Low*	*Avg*	*High*	*Low*	*Avg*	*High*	*Low*	*Avg*	*High*
	10,000	*Low*	*Avg*	*High*	*Low*	*Avg*	*High*	*Low*	*Avg*	*High*	*Low*	*Avg*	*High*
	12,000	*Low*	*Avg*	*High*	*Low*	*Avg*	*High*	*Low*	*Avg*	*High*	*Low*	*Avg*	*High*
	16,000	*Low*	*Avg*	*High*	*Low*	*Avg*	*High*	*Low*	*Avg*	*High*	*Low*	*Avg*	*High*

The total dredging time for each scenario was estimated using a template developed by Rock Island District, Operations Division (Graham 2007/08). This template calculates total dredging time based on the anticipated production rate for that dredge, the volume of sediment to be removed, mobilization/demobilization time, down time for placement site operations, delays required to maintain navigation, and re-handling of the dredged material if required.

Total cost for each scenario analyzed was estimated and also normalized on a per CY basis for ease in comparison with the Environmental Impact Single Score (EISS). The total dredging time for each scenario was estimated using a template developed by Rock Island District, Operations Division (Graham 2007/08). An average hourly cost for both the cutterhead pipeline dredge and mechanical bucket dredge crews was calculated based on Rock Island District 2005 dredging season records (Graham 2007/08). The total time was multiplied by the average cost per hour for each dredging crew yielding a total cost for each scenario in this study. The total cost is then divided by the volume of dredged material for each scenario resulting in a cost per cubic yard (Table 3.5). Normalizing the cost for dredging, on a per cubic yard basis, provides a common scale that allows comparison across multiple scenarios.

The total environmental burdens could then be compared to typical decision making criteria (Table 1.4) (USACE 2003-A). The EISS for each scenario were compared with the cost per CY of dredging, potential production rates, and transport distances to identify possible decision points. The results will provide a tool to help dredging decision-makers select equipment that will reduce air emissions at a comparable cost per CY, thus improving the sustainability of navigation channel maintenance dredging.

5.2 Conclusions

The evaluation of EISS versus cost per CY completed in this study support the commonly-accepted position that mechanical bucket dredges are better suited for long transport distances where a cutterhead pipeline dredge would be required to double-handle the dredged material (Table 4.3). This is consistent with common practice of avoiding double-handling of dredged material, if at all possible, to minimize the adverse aquatic environmental impacts to an intermediate placement site. In addition, the results indicate that mechanical bucket dredges have lower air emissions and cost per CY for smaller quantities of dredged material. This can be attributed to the mechanical bucket dredge's ability to be mobilized easily and economically relative to a cutterhead pipeline dredge. See Chapter 4 for a detailed explanation of the conclusions drawn for each specific scenario and evaluation format.

For scenarios with no clear choice of dredging method, the Tradeoff Index, *I,* gives guidance in determining if a modest cost increase will result in a large emission reduction or not to enable decision-makers to make an informed choice (Table 4.3). From Table 4.3 it can be seen that *I* increases with transport distance for most no clear choice cases, suggesting that at higher transport distances, a small additional cost may be worth it to decrease air emissions by a relatively large amount. In addition, *I* almost always increases with dredging material volume as well. Also, for a low dredged material volume *I* increases with production, but the converse is true for moderate and high dredged material volumes. This suggests that at low volumes, higher production rates may be worth some extra costs, but that lower production rates may be worth extra cost at moderate and high volumes.

CHAPTER 6: FUTURE WORK

This study proposes a process to evaluate dredging equipment emissions to the atmosphere using two specific types and sizes of comparable dredges. It utilizes an established USACE procedure for estimating the cost of fuel consumed by construction equipment and a Limited LCA to calculate the emissions per gallon of diesel fuel burned. This procedure could be expanded and improved on in multiple ways.

Documenting actual fuel usage data for the dredges and supporting equipment evaluated across a broad range of projects would help validate the diesel fuel consumption estimating procedure. In addition, actual data would better define how much fuel is consumed during mobilization, dredging, and transportation operations. This would better reflect the impacts of mobilization and transport distance on the total air emissions.

Expanding the scope of equipment analyzed to include both larger and smaller cutterhead pipeline and mechanical bucket dredges would provide a more universal tool applicable to a broad range of applications. Decision-makers could then consider altering not only the type of equipment selected to minimize air emissions but also the size of the dredge to maximize efficiency. This could also be expanded to include different types of mechanical excavation and suction pipeline dredges.

Similarly, the evaluation of a much wider range of potential production rates could potentially expand and enhance the procedure. This would allow decision-makers to consider the type and size of equipment as well as how site conditions and selection of a placement site impact efficiency and air emissions.

Collection of air quality measurements during the various dredging operations would improve the correlation between gallons of diesel fuel burned and the resulting emissions. This could be accomplished by collecting field data from comparable dredging equipment at similar sites. Conducting a study where a cutterhead pipeline and mechanical bucket dredge removed sediment from the same dredge cut would provide an even more realistic comparison of the two types of dredging equipment.

Another potential area for future work would be to evaluate the use of alternative fuels for dredging operations. Currently diesel fuel is the predominant fuel used in dredges and supporting equipment. There are some instances where an electric powered dredge is being used, particularly in larger ports to meet air quality standards. This fuel source severely limits the mobility of the dredge and applications where it could be utilized. However, the potential to use bio-fuels, natural gas, or other alternative fuels should be evaluated for efficiency and reductions in air emissions.

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APPENDIX A
GLOSSARY

APPENDIX A – GLOSSARY

BHP – Brake Horsepower

CDF – Confined Dredged Material Disposal Facility, an engineered and constructed site for the containment of dredged material within a specified foot print

CPD – Cutterhead Pipeline Dredge

CY – Cubic Yard

EISS – Environmental Impact Single Score

FF – Fuel Factor, a calculated value in gallons per BHP – hour for each type of equipment

HPF – Horsepower Factor, the average percentage of full horsepower utilized during normal operations for each type of equipment

IWW – Illinois Waterway

LCA – Life Cycle Assessment

LEED – Leadership in Energy and Environmental Design

MBD – Mechanical Bucket Dredge

NEPA – National Environmental Policy Act

Short Tons – 2,000 Pounds

USACE – United States Army Corps of Engineers

USEPA – United States Environmental Protection Agency

APPENDIX B

DREDGING
FUEL CONSUMPTION
CALCULATION TABLES

1,000 CY & 8,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 1,000 CY
Low Production Rate (Hyd. Dredging) = 51 CY/hr
Low Production Rate (Mech. Dredging) = 20 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 0 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 1

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 1.5 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.34	50.00		717		717
M/V LaSalle	2	400	800	60%	0.0309	24.69	50.00	38.05	1,234	939	2,174
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.67	50.00	38.05	134	102	235
Dozer (D6T)	1	200	200	70%	0.0360	7.20	50.00		360		360
Dozer (950G)	1	183	183	70%	0.0360	6.59	50.00		329		329
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.04	50.00	38.05	752	572	1,325
									3,527	1,614	**5,140**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.50	29.61		1,169		1,169
Cutter Head Engine	1	200	200	80%	0.0411	8.23	29.61		244		244
Booster Pumps	0	700	0	80%	0.0411	0.00	29.61		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.29	29.61		38		38
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.37	29.61	43.60	396	583	979
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.01	29.61		59		59
Tender (Max)	1	400	400	65%	0.0334	13.37	29.61	43.60	396	583	979
Tender (Scotty)	1	400	400	65%	0.0334	13.37	29.61	43.60	396	583	979
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.37		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.68	29.61		139		139
Tractor	1	80	80	65%	0.0334	2.67	29.61		79		79
Crissafully Pump	1	160	160	90%	0.0463	7.41	29.61		219		219
Anchor Barge	3	125	375	20%	0.0103	3.86	29.61		114		114
Crane	1	125	125	40%	0.0206	2.57	29.61		76		76
Light Plants	2	25	50	85%	0.0437	2.19	29.61	43.60	65	95	160
									3,390	2,427	**5,818**

1,000 CY & 8,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	1,000	CY
Average Production Rate (Hyd. Dredging) =	108	CY/hr
Average Production Rate (Mech. Dredging) =	36	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.5	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.34	27.78		398		398
M/V LaSalle	2	400	800	60%	0.0309	24.69	27.78	38.05	686	939	1,625
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.67	27.78	38.05	74	102	176
Dozer (D6T)	1	200	200	70%	0.0360	7.20	27.78		200		200
Dozer (950G)	1	183	183	70%	0.0360	6.59	27.78		183		183
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.04	27.78	38.05	418	572	990
									1,959	1,614	**3,573**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.50	13.98		552		552
Cutter Head Engine	1	200	200	80%	0.0411	8.23	13.98		115		115
Booster Pumps	0	700	0	80%	0.0411	0.00	13.98		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.29	13.98		18		18
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.37	13.98	43.60	187	583	770
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.01	13.98		28		28
Tender (Max)	1	400	400	65%	0.0334	13.37	13.98	43.60	187	583	770
Tender (Scotty)	1	400	400	65%	0.0334	13.37	13.98	43.60	187	583	770
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.37		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.68	13.98		65		65
Tractor	1	80	80	65%	0.0334	2.67	13.98		37		37
Crissafully Pump	1	160	160	90%	0.0463	7.41	13.98		104		104
Anchor Barge	3	125	375	20%	0.0103	3.86	13.98		54		54
Crane	1	125	125	40%	0.0206	2.57	13.98		36		36
Light Plants	2	25	50	85%	0.0437	2.19	13.98	43.60	31	95	126
									1,601	2,427	**4,028**

1,000 CY & 8,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	1,000	CY
High Production Rate (Hyd. Dredging) =	192	CY/hr
High Production Rate (Mech. Dredging) =	62	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.5	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.34	16.13		231		231
M/V LaSalle	2	400	800	60%	0.0309	24.69	16.13	38.05	398	939	1,338
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.67	16.13	38.05	43	102	145
Dozer (D6T)	1	200	200	70%	0.0360	7.20	16.13		116		116
Dozer (950G)	1	183	183	70%	0.0360	6.59	16.13		106		106
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.04	16.13	38.05	243	572	815
									1,138	1,614	**2,751**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.50	7.86		311		311
Cutter Head Engine	1	200	200	80%	0.0411	8.23	7.86		65		65
Booster Pumps	0	700	0	80%	0.0411	0.00	7.86		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.29	7.86		10		10
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.37	7.86	43.60	105	583	688
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.01	7.86		16		16
Tender (Max)	1	400	400	65%	0.0334	13.37	7.86	43.60	105	583	688
Tender (Scotty)	1	400	400	65%	0.0334	13.37	7.86	43.60	105	583	688
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.37		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.68	7.86		37		37
Tractor	1	80	80	65%	0.0334	2.67	7.86		21		21
Crissafully Pump	1	160	160	90%	0.0463	7.41	7.86		58		58
Anchor Barge	3	125	375	20%	0.0103	3.86	7.86		30		30
Crane	1	125	125	40%	0.0206	2.57	7.86		20		20
Light Plants	2	25	50	85%	0.0437	2.19	7.86	43.60	17	95	112
									901	2,427	**3,328**

1,000 CY & 10,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 1,000 CY
Low Production Rate (Hyd. Dredging) = 51 CY/hr
Low Production Rate (Mech. Dredging) = 20 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 0 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 1

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 1.9 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	50.00		717		717
M/V LaSalle	2	400	800	60%	0.0309	24.7	50.00	38.94	1,234	961	2,195
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	50.00	38.94	134	104	238
Dozer (D6T)	1	200	200	70%	0.0360	7.2	50.00		360		360
Dozer (950G)	1	183	183	70%	0.0360	6.6	50.00		329		329
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	50.00	38.94	752	586	1,338
									3,527	1,651	**5,178**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	29.61		1,169		1,169
Cutter Head Engine	1	200	200	80%	0.0411	8.2	29.61		244		244
Booster Pumps	1	700	700	80%	0.0411	28.8	29.61		853		853
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	29.61		38		38
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	29.61	43.60	396	583	979
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	29.61		59		59
Tender (Max)	1	400	400	65%	0.0334	13.4	29.61	43.60	396	583	979
Tender (Scotty)	1	400	400	65%	0.0334	13.4	29.61	43.60	396	583	979
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	29.61		139		139
Tractor	1	80	80	65%	0.0334	2.7	29.61		79		79
Crissafully Pump	1	160	160	90%	0.0463	7.4	29.61		219		219
Anchor Barge	3	125	375	20%	0.0103	3.9	29.61		114		114
Crane	1	125	125	40%	0.0206	2.6	29.61		76		76
Light Plants	2	25	50	85%	0.0437	2.2	29.61	43.60	65	95	160
									4,243	2,427	**6,670**

1,000 CY & 10,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	1,000	CY
Average Production Rate (Hyd. Dredging) =	108	CY/hr
Average Production Rate (Mech. Dredging) =	36	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.9	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.34	27.78		398		398
M/V LaSalle	2	400	800	60%	0.0309	24.69	27.78	38.94	686	961	1,647
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.67	27.78	38.94	74	104	178
Dozer (D6T)	1	200	200	70%	0.0360	7.20	27.78		200		200
Dozer (950G)	1	183	183	70%	0.0360	6.59	27.78		183		183
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.04	27.78	38.94	418	586	1,004
									1,959	1,651	**3,610**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.50	13.98		552		552
Cutter Head Engine	1	200	200	80%	0.0411	8.23	13.98		115		115
Booster Pumps	1	700	700	80%	0.0411	28.80	13.98		403		403
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.29	13.98		18		18
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.37	13.98	43.60	187	583	770
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.01	13.98		28		28
Tender (Max)	1	400	400	65%	0.0334	13.37	13.98	43.60	187	583	770
Tender (Scotty)	1	400	400	65%	0.0334	13.37	13.98	43.60	187	583	770
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.37		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.68	13.98		65		65
Tractor	1	80	80	65%	0.0334	2.67	13.98		37		37
Crissafully Pump	1	160	160	90%	0.0463	7.41	13.98		104		104
Anchor Barge	3	125	375	20%	0.0103	3.86	13.98		54		54
Crane	1	125	125	40%	0.0206	2.57	13.98		36		36
Light Plants	2	25	50	85%	0.0437	2.19	13.98	43.60	31	95	126
									2,004	2,427	**4,431**

1,000 CY & 10,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	1,000	CY
High Production Rate (Hyd. Dredging) =	192	CY/hr
High Production Rate (Mech. Dredging) =	62	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.9	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	16.13		231		231
M/V LaSalle	2	400	800	60%	0.0309	24.7	16.13	38.94	398	961	1,359
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	16.13	38.94	43	104	147
Dozer (D6T)	1	200	200	70%	0.0360	7.2	16.13		116		116
Dozer (950G)	1	183	183	70%	0.0360	6.6	16.13		106		106
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	16.13	38.94	243	586	828
									1,138	1,651	**2,789**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	7.86		311		311
Cutter Head Engine	1	200	200	80%	0.0411	8.2	7.86		65		65
Booster Pumps	1	700	700	80%	0.0411	28.8	7.86		227		227
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	7.86		10		10
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	7.86	43.60	105	583	688
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	7.86		16		16
Tender (Max)	1	400	400	65%	0.0334	13.4	7.86	43.60	105	583	688
Tender (Scotty)	1	400	400	65%	0.0334	13.4	7.86	43.60	105	583	688
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	7.86		37		37
Tractor	1	80	80	65%	0.0334	2.7	7.86		21		21
Crissafully Pump	1	160	160	90%	0.0463	7.4	7.86		58		58
Anchor Barge	3	125	375	20%	0.0103	3.9	7.86		30		30
Crane	1	125	125	40%	0.0206	2.6	7.86		20		20
Light Plants	2	25	50	85%	0.0437	2.2	7.86	43.60	17	95	112
									1,127	2,427	**3,554**

1,000 CY & 12,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	1,000	CY
Low Production Rate (Hyd. Dredging) =	51	CY/hr
Low Production Rate (Mech. Dredging) =	20	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	2.3	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	50.00		717		717
M/V LaSalle	2	400	800	60%	0.0309	24.7	50.00	39.82	1,234	983	2,217
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	50.00	39.82	134	106	240
Dozer (D6T)	1	200	200	70%	0.0360	7.2	50.00		360		360
Dozer (950G)	1	183	183	70%	0.0360	6.6	50.00		329		329
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	50.00	39.82	752	599	1,351
									3,527	1,688	**5,215**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	29.61		1,169		1,169
Cutter Head Engine	1	200	200	80%	0.0411	8.2	29.61		244		244
Booster Pumps	2	700	1400	80%	0.0411	57.6	29.61		1,705		1,705
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	29.61		38		38
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	29.61	43.60	396	583	979
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	29.61		59		59
Tender (Max)	1	400	400	65%	0.0334	13.4	29.61	43.60	396	583	979
Tender (Scotty)	1	400	400	65%	0.0334	13.4	29.61	43.60	396	583	979
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	29.61		139		139
Tractor	1	80	80	65%	0.0334	2.7	29.61		79		79
Crissafully Pump	1	160	160	90%	0.0463	7.4	29.61		219		219
Anchor Barge	3	125	375	20%	0.0103	3.9	29.61		114		114
Crane	1	125	125	40%	0.0206	2.6	29.61		76		76
Light Plants	2	25	50	85%	0.0437	2.2	29.61	43.60	65	95	160
									5,096	2,427	**7,523**

1,000 CY & 12,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	1,000	CY
Average Production Rate (Hyd. Dredging) =	108	CY/hr
Average Production Rate (Mech. Dredging) =	36	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	2.3	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	27.78		398		398
M/V LaSalle	2	400	800	60%	0.0309	24.7	27.78	39.82	686	983	1,669
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	27.78	39.82	74	106	181
Dozer (D6T)	1	200	200	70%	0.0360	7.2	27.78		200		200
Dozer (950G)	1	183	183	70%	0.0360	6.6	27.78		183		183
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	27.78	39.82	418	599	1,017
									1,959	1,688	**3,648**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	13.98		552		552
Cutter Head Engine	1	200	200	80%	0.0411	8.2	13.98		115		115
Booster Pumps	2	700	1400	80%	0.0411	57.6	13.98		805		805
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	13.98		18		18
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	13.98	43.60	187	583	770
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	13.98		28		28
Tender (Max)	1	400	400	65%	0.0334	13.4	13.98	43.60	187	583	770
Tender (Scotty)	1	400	400	65%	0.0334	13.4	13.98	43.60	187	583	770
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	13.98		65		65
Tractor	1	80	80	65%	0.0334	2.7	13.98		37		37
Crissafully Pump	1	160	160	90%	0.0463	7.4	13.98		104		104
Anchor Barge	3	125	375	20%	0.0103	3.9	13.98		54		54
Crane	1	125	125	40%	0.0206	2.6	13.98		36		36
Light Plants	2	25	50	85%	0.0437	2.2	13.98	43.60	31	95	126
									2,406	2,427	**4,834**

1,000 CY & 12,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	1,000	CY
High Production Rate (Hyd. Dredging) =	192	CY/hr
High Production Rate (Mech. Dredging) =	62	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	2.3	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	16.13		231		231
M/V LaSalle	2	400	800	60%	0.0309	24.7	16.13	39.82	398	983	1,381
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	16.13	39.82	43	106	150
Dozer (D6T)	1	200	200	70%	0.0360	7.2	16.13		116		116
Dozer (950G)	1	183	183	70%	0.0360	6.6	16.13		106		106
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	16.13	39.82	243	599	842
									1,138	1,688	**2,826**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	7.86		311		311
Cutter Head Engine	1	200	200	80%	0.0411	8.2	7.86		65		65
Booster Pumps	2	700	1400	80%	0.0411	57.6	7.86		453		453
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	7.86		10		10
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	7.86	43.60	105	583	688
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	7.86		16		16
Tender (Max)	1	400	400	65%	0.0334	13.4	7.86	43.60	105	583	688
Tender (Scotty)	1	400	400	65%	0.0334	13.4	7.86	43.60	105	583	688
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	7.86		37		37
Tractor	1	80	80	65%	0.0334	2.7	7.86		21		21
Crissafully Pump	1	160	160	90%	0.0463	7.4	7.86		58		58
Anchor Barge	3	125	375	20%	0.0103	3.9	7.86		30		30
Crane	1	125	125	40%	0.0206	2.6	7.86		20		20
Light Plants	2	25	50	85%	0.0437	2.2	7.86	43.60	17	95	112
									1,354	2,427	**3,781**

1,000 CY & 16,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 1,000 CY
Low Production Rate (Hyd. Dredging) = 51 CY/hr
Low Production Rate (Mech. Dredging) = 20 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 1.5 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 2

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 3.0 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	50.00		717		717
M/V LaSalle	2	400	800	60%	0.0309	24.7	50.00	41.36	1,234	1,021	2,255
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	50.00	41.36	134	111	244
Dozer (D6T)	1	200	200	70%	0.0360	7.2	50.00		360		360
Dozer (950G)	1	183	183	70%	0.0360	6.6	50.00		329		329
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	50.00	41.36	752	622	1,374
									3,527	1,754	**5,280**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	59.22		2,339		2,339
Cutter Head Engine	1	200	200	80%	0.0411	8.2	59.22		487		487
Booster Pumps	0	700	0	80%	0.0411	0.0	59.22		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	59.22		76		76
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	59.22	44.20	792	591	1,383
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	59.22		119		119
Tender (Max)	1	400	400	65%	0.0334	13.4	59.22	44.20	792	591	1,383
Tender (Scotty)	1	400	400	65%	0.0334	13.4	59.22	44.20	792	591	1,383
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		44.20		591	591
Tractor	1	140	140	65%	0.0334	4.7	59.22		277		277
Tractor	1	80	80	65%	0.0334	2.7	59.22		158		158
Crissafully Pump	1	160	160	90%	0.0463	7.4	59.22		439		439
Anchor Barge	3	125	375	20%	0.0103	3.9	59.22		228		228
Crane	1	125	125	40%	0.0206	2.6	59.22		152		152
Light Plants	2	25	50	85%	0.0437	2.2	59.22	44.20	129	97	226
									6,781	2,461	**9,241**

1,000 CY & 16,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 1,000 CY
Average Production Rate (Hyd. Dredging) = 108 CY/hr
Average Production Rate (Mech. Dredging) = 36 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 1.5 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 2

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 3.0 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	27.78		398		398
M/V LaSalle	2	400	800	60%	0.0309	24.7	27.78	41.36	686	1,021	1,707
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	27.78	41.36	74	111	185
Dozer (D6T)	1	200	200	70%	0.0360	7.2	27.78		200		200
Dozer (950G)	1	183	183	70%	0.0360	6.6	27.78		183		183
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	27.78	41.36	418	622	1,040
									1,959	1,754	**3,713**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	27.96		1,104		1,104
Cutter Head Engine	1	200	200	80%	0.0411	8.2	27.96		230		230
Booster Pumps	0	700	0	80%	0.0411	0.0	27.96		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	27.96		36		36
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	27.96	44.20	374	591	965
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	27.96		56		56
Tender (Max)	1	400	400	65%	0.0334	13.4	27.96	44.20	374	591	965
Tender (Scotty)	1	400	400	65%	0.0334	13.4	27.96	44.20	374	591	965
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		44.20		591	591
Tractor	1	140	140	65%	0.0334	4.7	27.96		131		131
Tractor	1	80	80	65%	0.0334	2.7	27.96		75		75
Crissafully Pump	1	160	160	90%	0.0463	7.4	27.96		207		207
Anchor Barge	3	125	375	20%	0.0103	3.9	27.96		108		108
Crane	1	125	125	40%	0.0206	2.6	27.96		72		72
Light Plants	2	25	50	85%	0.0437	2.2	27.96	44.20	61	97	158
									3,202	2,461	**5,663**

1,000 CY & 16,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 1,000 CY
High Production Rate (Hyd. Dredging) = 192 CY/hr
High Production Rate (Mech. Dredging) = 62 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 1.5 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 2

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 3.0 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	16.13		231		231
M/V LaSalle	2	400	800	60%	0.0309	24.7	16.13	41.36	398	1,021	1,419
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	16.13	41.36	43	111	154
Dozer (D6T)	1	200	200	70%	0.0360	7.2	16.13		116		116
Dozer (950G)	1	183	183	70%	0.0360	6.6	16.13		106		106
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	16.13	41.36	243	622	865
									1,138	1,754	**2,891**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	15.73		621		621
Cutter Head Engine	1	200	200	80%	0.0411	8.2	15.73		129		129
Booster Pumps	0	700	0	80%	0.0411	0.0	15.73		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	15.73		20		20
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	15.73	44.20	210	591	801
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	15.73		32		32
Tender (Max)	1	400	400	65%	0.0334	13.4	15.73	44.20	210	591	801
Tender (Scotty)	1	400	400	65%	0.0334	13.4	15.73	44.20	210	591	801
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		44.20		591	591
Tractor	1	140	140	65%	0.0334	4.7	15.73		74		74
Tractor	1	80	80	65%	0.0334	2.7	15.73		42		42
Crissafully Pump	1	160	160	90%	0.0463	7.4	15.73		116		116
Anchor Barge	3	125	375	20%	0.0103	3.9	15.73		61		61
Crane	1	125	125	40%	0.0206	2.6	15.73		40		40
Light Plants	2	25	50	85%	0.0437	2.2	15.73	44.20	34	97	131
									1,801	2,461	**4,262**

5,000 CY & 16,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	5,000	CY
Average Production Rate (Hyd. Dredging) =	108	CY/hr
Average Production Rate (Mech. Dredging) =	36	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	1.5	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	2	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	3.0	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	138.89		1,992		1,992
M/V LaSalle	2	400	800	60%	0.0309	24.7	138.89	67.79	3,429	1,673	5,102
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	138.89	67.79	371	181	553
Dozer (D6T)	1	200	200	70%	0.0360	7.2	138.89		1,000		1,000
Dozer (950G)	1	183	183	70%	0.0360	6.6	138.89		915		915
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	138.89	67.79	2,089	1,020	3,109
									9,796	2,874	**12,671**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	139.81		5,522		5,522
Cutter Head Engine	1	200	200	80%	0.0411	8.2	139.81		1,150		1,150
Booster Pumps	0	700	0	80%	0.0411	0.0	139.81		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	139.81		180		180
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	139.81	44.20	1,870	591	2,461
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	139.81		280		280
Tender (Max)	1	400	400	65%	0.0334	13.4	139.81	44.20	1,870	591	2,461
Tender (Scotty)	1	400	400	65%	0.0334	13.4	139.81	44.20	1,870	591	2,461
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		44.20		591	591
Tractor	1	140	140	65%	0.0334	4.7	139.81		654		654
Tractor	1	80	80	65%	0.0334	2.7	139.81		374		374
Crissafully Pump	1	160	160	90%	0.0463	7.4	139.81		1,035		1,035
Anchor Barge	3	125	375	20%	0.0103	3.9	139.81		539		539
Crane	1	125	125	40%	0.0206	2.6	139.81		360		360
Light Plants	2	25	50	85%	0.0437	2.2	139.81	44.20	306	97	402
									16,010	2,461	**18,470**

5,000 CY & 8,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	5,000	CY
Low Production Rate (Hyd. Dredging) =	51	CY/hr
Low Production Rate (Mech. Dredging) =	20	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.5	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	250.00		3,585		3,585
M/V LaSalle	2	400	800	60%	0.0309	24.7	250.00	51.27	6,171	1,266	7,437
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	250.00	51.27	669	137	806
Dozer (D6T)	1	200	200	70%	0.0360	7.2	250.00		1,800		1,800
Dozer (950G)	1	183	183	70%	0.0360	6.6	250.00		1,647		1,647
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	250.00	51.27	3,761	771	4,532
									17,633	2,174	**19,807**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	148.04		5,847		5,847
Cutter Head Engine	1	200	200	80%	0.0411	8.2	148.04		1,218		1,218
Booster Pumps	0	700	0	80%	0.0411	0.0	148.04		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	148.04		190		190
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	148.04	43.60	1,979	583	2,562
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	148.04		297		297
Tender (Max)	1	400	400	65%	0.0334	13.4	148.04	43.60	1,979	583	2,562
Tender (Scotty)	1	400	400	65%	0.0334	13.4	148.04	43.60	1,979	583	2,562
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	148.04		693		693
Tractor	1	80	80	65%	0.0334	2.7	148.04		396		396
Crissafully Pump	1	160	160	90%	0.0463	7.4	148.04		1,096		1,096
Anchor Barge	3	125	375	20%	0.0103	3.9	148.04		571		571
Crane	1	125	125	40%	0.0206	2.6	148.04		381		381
Light Plants	2	25	50	85%	0.0437	2.2	148.04	43.60	324	95	419
									16,951	2,427	**19,379**

5,000 CY & 8,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	5,000	CY
Average Production Rate (Hyd. Dredging) =	108	CY/hr
Average Production Rate (Mech. Dredging) =	36	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.5	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	138.89		1,992		1,992
M/V LaSalle	2	400	800	60%	0.0309	24.7	138.89	51.27	3,429	1,266	4,694
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	138.89	51.27	371	137	509
Dozer (D6T)	1	200	200	70%	0.0360	7.2	138.89		1,000		1,000
Dozer (950G)	1	183	183	70%	0.0360	6.6	138.89		915		915
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	138.89	51.27	2,089	771	2,861
									9,796	2,174	**11,970**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	69.91		2,761		2,761
Cutter Head Engine	1	200	200	80%	0.0411	8.2	69.91		575		575
Booster Pumps	0	700	0	80%	0.0411	0.0	69.91		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	69.91		90		90
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	69.91	43.60	935	583	1,518
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	69.91		140		140
Tender (Max)	1	400	400	65%	0.0334	13.4	69.91	43.60	935	583	1,518
Tender (Scotty)	1	400	400	65%	0.0334	13.4	69.91	43.60	935	583	1,518
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	69.91		327		327
Tractor	1	80	80	65%	0.0334	2.7	69.91		187		187
Crissafully Pump	1	160	160	90%	0.0463	7.4	69.91		518		518
Anchor Barge	3	125	375	20%	0.0103	3.9	69.91		270		270
Crane	1	125	125	40%	0.0206	2.6	69.91		180		180
Light Plants	2	25	50	85%	0.0437	2.2	69.91	43.60	153	95	248
									8,005	2,427	**10,432**

5,000 CY & 8,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	5,000	CY
High Production Rate (Hyd. Dredging) =	192	CY/hr
High Production Rate (Mech. Dredging) =	62	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.5	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	80.65		1,157		1,157
M/V LaSalle	2	400	800	60%	0.0309	24.7	80.65	51.27	1,991	1,266	3,256
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	80.65	51.27	216	137	353
Dozer (D6T)	1	200	200	70%	0.0360	7.2	80.65		581		581
Dozer (950G)	1	183	183	70%	0.0360	6.6	80.65		531		531
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	80.65	51.27	1,213	771	1,984
									5,688	2,174	**7,862**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	39.32		1,553		1,553
Cutter Head Engine	1	200	200	80%	0.0411	8.2	39.32		324		324
Booster Pumps	0	700	0	80%	0.0411	0.0	39.32		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	39.32		51		51
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	39.32	43.60	526	583	1,109
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	39.32		79		79
Tender (Max)	1	400	400	65%	0.0334	13.4	39.32	43.60	526	583	1,109
Tender (Scotty)	1	400	400	65%	0.0334	13.4	39.32	43.60	526	583	1,109
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	39.32		184		184
Tractor	1	80	80	65%	0.0334	2.7	39.32		105		105
Crissafully Pump	1	160	160	90%	0.0463	7.4	39.32		291		291
Anchor Barge	3	125	375	20%	0.0103	3.9	39.32		152		152
Crane	1	125	125	40%	0.0206	2.6	39.32		101		101
Light Plants	2	25	50	85%	0.0437	2.2	39.32	43.60	86	95	181
									4,503	2,427	**6,930**

5,000 CY & 10,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	5,000	CY
Low Production Rate (Hyd. Dredging) =	51	CY/hr
Low Production Rate (Mech. Dredging) =	20	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.9	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	250.00		3,585		3,585
M/V LaSalle	2	400	800	60%	0.0309	24.7	250.00	55.68	6,171	1,374	7,546
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	250.00	55.68	669	149	817
Dozer (D6T)	1	200	200	70%	0.0360	7.2	250.00		1,800		1,800
Dozer (950G)	1	183	183	70%	0.0360	6.6	250.00		1,647		1,647
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	250.00	55.68	3,761	838	4,598
									17,633	2,361	**19,994**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	148.04		5,847		5,847
Cutter Head Engine	1	200	200	80%	0.0411	8.2	148.04		1,218		1,218
Booster Pumps	1	700	700	80%	0.0411	28.8	148.04		4,264		4,264
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	148.04		190		190
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	148.04	43.60	1,979	583	2,562
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	148.04		297		297
Tender (Max)	1	400	400	65%	0.0334	13.4	148.04	43.60	1,979	583	2,562
Tender (Scotty)	1	400	400	65%	0.0334	13.4	148.04	43.60	1,979	583	2,562
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	148.04		693		693
Tractor	1	80	80	65%	0.0334	2.7	148.04		396		396
Crissafully Pump	1	160	160	90%	0.0463	7.4	148.04		1,096		1,096
Anchor Barge	3	125	375	20%	0.0103	3.9	148.04		571		571
Crane	1	125	125	40%	0.0206	2.6	148.04		381		381
Light Plants	2	25	50	85%	0.0437	2.2	148.04	43.60	324	95	419
									21,215	2,427	**23,642**

5,000 CY & 10,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	5,000	CY
Average Production Rate (Hyd. Dredging) =	108	CY/hr
Average Production Rate (Mech. Dredging) =	36	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.9	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	138.89		1,992		1,992
M/V LaSalle	2	400	800	60%	0.0309	24.7	138.89	55.68	3,429	1,374	4,803
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	138.89	55.68	371	149	520
Dozer (D6T)	1	200	200	70%	0.0360	7.2	138.89		1,000		1,000
Dozer (950G)	1	183	183	70%	0.0360	6.6	138.89		915		915
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	138.89	55.68	2,089	838	2,927
									9,796	2,361	**12,157**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	69.91		2,761		2,761
Cutter Head Engine	1	200	200	80%	0.0411	8.2	69.91		575		575
Booster Pumps	1	700	700	80%	0.0411	28.8	69.91		2,013		2,013
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	69.91		90		90
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	69.91	43.60	935	583	1,518
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	69.91		140		140
Tender (Max)	1	400	400	65%	0.0334	13.4	69.91	43.60	935	583	1,518
Tender (Scotty)	1	400	400	65%	0.0334	13.4	69.91	43.60	935	583	1,518
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	69.91		327		327
Tractor	1	80	80	65%	0.0334	2.7	69.91		187		187
Crissafully Pump	1	160	160	90%	0.0463	7.4	69.91		518		518
Anchor Barge	3	125	375	20%	0.0103	3.9	69.91		270		270
Crane	1	125	125	40%	0.0206	2.6	69.91		180		180
Light Plants	2	25	50	85%	0.0437	2.2	69.91	43.60	153	95	248
									10,018	2,427	**12,445**

5,000 CY & 10,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	5,000	CY
High Production Rate (Hyd. Dredging) =	192	CY/hr
High Production Rate (Mech. Dredging) =	62	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.9	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	80.65		1,157		1,157
M/V LaSalle	2	400	800	60%	0.0309	24.7	80.65	55.68	1,991	1,374	3,365
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	80.65	55.68	216	149	365
Dozer (D6T)	1	200	200	70%	0.0360	7.2	80.65		581		581
Dozer (950G)	1	183	183	70%	0.0360	6.6	80.65		531		531
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	80.65	55.68	1,213	838	2,051
									5,688	2,361	**8,049**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	39.32		1,553		1,553
Cutter Head Engine	1	200	200	80%	0.0411	8.2	39.32		324		324
Booster Pumps	1	700	700	80%	0.0411	28.8	39.32		1,133		1,133
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	39.32		51		51
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	39.32	43.60	526	583	1,109
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	39.32		79		79
Tender (Max)	1	400	400	65%	0.0334	13.4	39.32	43.60	526	583	1,109
Tender (Scotty)	1	400	400	65%	0.0334	13.4	39.32	43.60	526	583	1,109
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	39.32		184		184
Tractor	1	80	80	65%	0.0334	2.7	39.32		105		105
Crissafully Pump	1	160	160	90%	0.0463	7.4	39.32		291		291
Anchor Barge	3	125	375	20%	0.0103	3.9	39.32		152		152
Crane	1	125	125	40%	0.0206	2.6	39.32		101		101
Light Plants	2	25	50	85%	0.0437	2.2	39.32	43.60	86	95	181
									5,635	2,427	**8,062**

5,000 CY & 12,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	5,000	CY
Low Production Rate (Hyd. Dredging) =	51	CY/hr
Low Production Rate (Mech. Dredging) =	20	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	2.3	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	250.00		3,585		3,585
M/V LaSalle	2	400	800	60%	0.0309	24.7	250.00	60.08	6,171	1,483	7,655
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	250.00	60.08	669	161	829
Dozer (D6T)	1	200	200	70%	0.0360	7.2	250.00		1,800		1,800
Dozer (950G)	1	183	183	70%	0.0360	6.6	250.00		1,647		1,647
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	250.00	60.08	3,761	904	4,664
									17,633	2,548	**20,181**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	148.04		5,847		5,847
Cutter Head Engine	1	200	200	80%	0.0411	8.2	148.04		1,218		1,218
Booster Pumps	2	700	1400	80%	0.0411	57.6	148.04		8,527		8,527
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	148.04		190		190
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	148.04	43.60	1,979	583	2,562
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	148.04		297		297
Tender (Max)	1	400	400	65%	0.0334	13.4	148.04	43.60	1,979	583	2,562
Tender (Scotty)	1	400	400	65%	0.0334	13.4	148.04	43.60	1,979	583	2,562
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	148.04		693		693
Tractor	1	80	80	65%	0.0334	2.7	148.04		396		396
Crissafully Pump	1	160	160	90%	0.0463	7.4	148.04		1,096		1,096
Anchor Barge	3	125	375	20%	0.0103	3.9	148.04		571		571
Crane	1	125	125	40%	0.0206	2.6	148.04		381		381
Light Plants	2	25	50	85%	0.0437	2.2	148.04	43.60	324	95	419
									25,478	2,427	**27,906**

5,000 CY & 12,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	5,000	CY
Average Production Rate (Hyd. Dredging) =	108	CY/hr
Average Production Rate (Mech. Dredging) =	36	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	2.3	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	138.89		1,992		1,992
M/V LaSalle	2	400	800	60%	0.0309	24.7	138.89	60.08	3,429	1,483	4,912
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	138.89	60.08	371	161	532
Dozer (D6T)	1	200	200	70%	0.0360	7.2	138.89		1,000		1,000
Dozer (950G)	1	183	183	70%	0.0360	6.6	138.89		915		915
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	138.89	60.08	2,089	904	2,993
									9,796	2,548	**12,344**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	69.91		2,761		2,761
Cutter Head Engine	1	200	200	80%	0.0411	8.2	69.91		575		575
Booster Pumps	2	700	1400	80%	0.0411	57.6	69.91		4,027		4,027
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	69.91		90		90
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	69.91	43.60	935	583	1,518
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	69.91		140		140
Tender (Max)	1	400	400	65%	0.0334	13.4	69.91	43.60	935	583	1,518
Tender (Scotty)	1	400	400	65%	0.0334	13.4	69.91	43.60	935	583	1,518
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	69.91		327		327
Tractor	1	80	80	65%	0.0334	2.7	69.91		187		187
Crissafully Pump	1	160	160	90%	0.0463	7.4	69.91		518		518
Anchor Barge	3	125	375	20%	0.0103	3.9	69.91		270		270
Crane	1	125	125	40%	0.0206	2.6	69.91		180		180
Light Plants	2	25	50	85%	0.0437	2.2	69.91	43.60	153	95	248
									12,031	2,427	**14,459**

5,000 CY & 12,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	5,000	CY
High Production Rate (Hyd. Dredging) =	192	CY/hr
High Production Rate (Mech. Dredging) =	62	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	2.3	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	80.65		1,157		1,157
M/V LaSalle	2	400	800	60%	0.0309	24.7	80.65	60.08	1,991	1,483	3,474
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	80.65	60.08	216	161	376
Dozer (D6T)	1	200	200	70%	0.0360	7.2	80.65		581		581
Dozer (950G)	1	183	183	70%	0.0360	6.6	80.65		531		531
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	80.65	60.08	1,213	904	2,117
									5,688	2,548	**8,236**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	39.32		1,553		1,553
Cutter Head Engine	1	200	200	80%	0.0411	8.2	39.32		324		324
Booster Pumps	2	700	1400	80%	0.0411	57.6	39.32		2,265		2,265
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	39.32		51		51
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	39.32	43.60	526	583	1,109
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	39.32		79		79
Tender (Max)	1	400	400	65%	0.0334	13.4	39.32	43.60	526	583	1,109
Tender (Scotty)	1	400	400	65%	0.0334	13.4	39.32	43.60	526	583	1,109
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	39.32		184		184
Tractor	1	80	80	65%	0.0334	2.7	39.32		105		105
Crissafully Pump	1	160	160	90%	0.0463	7.4	39.32		291		291
Anchor Barge	3	125	375	20%	0.0103	3.9	39.32		152		152
Crane	1	125	125	40%	0.0206	2.6	39.32		101		101
Light Plants	2	25	50	85%	0.0437	2.2	39.32	43.60	86	95	181
									6,768	2,427	**9,195**

5,000 CY & 16,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 5,000 CY
Low Production Rate (Hyd. Dredging) = 51 CY/hr
Low Production Rate (Mech. Dredging) = 20 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 1.5 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 2

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 3.0 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	250.00		3,585		3,585
M/V LaSalle	2	400	800	60%	0.0309	24.7	250.00	67.79	6,171	1,673	7,845
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	250.00	67.79	669	181	850
Dozer (D6T)	1	200	200	70%	0.0360	7.2	250.00		1,800		1,800
Dozer (950G)	1	183	183	70%	0.0360	6.6	250.00		1,647		1,647
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	250.00	67.79	3,761	1,020	4,780
									17,633	2,874	**20,507**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	296.08		11,694		11,694
Cutter Head Engine	1	200	200	80%	0.0411	8.2	296.08		2,436		2,436
Booster Pumps	0	700	0	80%	0.0411	0.0	296.08		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	296.08		381		381
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	296.08	44.20	3,959	591	4,550
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	296.08		594		594
Tender (Max)	1	400	400	65%	0.0334	13.4	296.08	44.20	3,959	591	4,550
Tender (Scotty)	1	400	400	65%	0.0334	13.4	296.08	44.20	3,959	591	4,550
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		44.20		591	591
Tractor	1	140	140	65%	0.0334	4.7	296.08		1,386		1,386
Tractor	1	80	80	65%	0.0334	2.7	296.08		792		792
Crissafully Pump	1	160	160	90%	0.0463	7.4	296.08		2,193		2,193
Anchor Barge	3	125	375	20%	0.0103	3.9	296.08		1,142		1,142
Crane	1	125	125	40%	0.0206	2.6	296.08		761		761
Light Plants	2	25	50	85%	0.0437	2.2	296.08	44.20	647	97	744
									33,903	2,461	**36,363**

5,000 CY & 16,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 5,000 CY
High Production Rate (Hyd. Dredging) = 192 CY/hr
High Production Rate (Mech. Dredging) = 62 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 1.5 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 2

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 3.0 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	80.65		1,157		1,157
M/V LaSalle	2	400	800	60%	0.0309	24.7	80.65	67.79	1,991	1,673	3,664
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	80.65	67.79	216	181	397
Dozer (D6T)	1	200	200	70%	0.0360	7.2	80.65		581		581
Dozer (950G)	1	183	183	70%	0.0360	6.6	80.65		531		531
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	80.65	67.79	1,213	1,020	2,233
									5,688	2,874	**8,563**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	78.65		3,106		3,106
Cutter Head Engine	1	200	200	80%	0.0411	8.2	78.65		647		647
Booster Pumps	0	700	0	80%	0.0411	0.0	78.65		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	78.65		101		101
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	78.65	44.20	1,052	591	1,643
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	78.65		158		158
Tender (Max)	1	400	400	65%	0.0334	13.4	78.65	44.20	1,052	591	1,643
Tender (Scotty)	1	400	400	65%	0.0334	13.4	78.65	44.20	1,052	591	1,643
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		44.20		591	591
Tractor	1	140	140	65%	0.0334	4.7	78.65		368		368
Tractor	1	80	80	65%	0.0334	2.7	78.65		210		210
Crissafully Pump	1	160	160	90%	0.0463	7.4	78.65		582		582
Anchor Barge	3	125	375	20%	0.0103	3.9	78.65		303		303
Crane	1	125	125	40%	0.0206	2.6	78.65		202		202
Light Plants	2	25	50	85%	0.0437	2.2	78.65	44.20	172	97	269
									9,005	2,461	**11,466**

20,000 CY & 8,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 20,000 CY
Low Production Rate (Hyd. Dredging) = 51 CY/hr
Low Production Rate (Mech. Dredging) = 20 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 0 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 1

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 1.5 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	1,000.00		14,341		14,341
M/V LaSalle	2	400	800	60%	0.0309	24.7	1,000.00	100.83	24,686	2,489	27,175
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	1,000.00	100.83	2,674	270	2,944
Dozer (D6T)	1	200	200	70%	0.0360	7.2	1,000.00		7,200		7,200
Dozer (950G)	1	183	183	70%	0.0360	6.6	1,000.00		6,588		6,588
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	1,000.00	100.83	15,043	1,517	16,560
									70,532	4,275	**74,807**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	592.16		23,389		23,389
Cutter Head Engine	1	200	200	80%	0.0411	8.2	592.16		4,873		4,873
Booster Pumps	0	700	0	80%	0.0411	0.0	592.16		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	592.16		761		761
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	592.16	43.60	7,918	583	8,501
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	592.16		1,188		1,188
Tender (Max)	1	400	400	65%	0.0334	13.4	592.16	43.60	7,918	583	8,501
Tender (Scotty)	1	400	400	65%	0.0334	13.4	592.16	43.60	7,918	583	8,501
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	592.16		2,771		2,771
Tractor	1	80	80	65%	0.0334	2.7	592.16		1,584		1,584
Crissafully Pump	1	160	160	90%	0.0463	7.4	592.16		4,385		4,385
Anchor Barge	3	125	375	20%	0.0103	3.9	592.16		2,284		2,284
Crane	1	125	125	40%	0.0206	2.6	592.16		1,523		1,523
Light Plants	2	25	50	85%	0.0437	2.2	592.16	43.60	1,294	95	1,390
									67,805	2,427	**70,233**

20,000 CY & 8,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	20,000	CY
Average Production Rate (Hyd. Dredging) =	108	CY/hr
Average Production Rate (Mech. Dredging) =	36	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.5	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	555.56		7,967		7,967
M/V LaSalle	2	400	800	60%	0.0309	24.7	555.56	100.83	13,714	2,489	16,203
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	555.56	100.83	1,486	270	1,755
Dozer (D6T)	1	200	200	70%	0.0360	7.2	555.56		4,000		4,000
Dozer (950G)	1	183	183	70%	0.0360	6.6	555.56		3,660		3,660
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	555.56	100.83	8,357	1,517	9,874
									39,184	4,275	**43,460**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	279.63		11,045		11,045
Cutter Head Engine	1	200	200	80%	0.0411	8.2	279.63		2,301		2,301
Booster Pumps	0	700	0	80%	0.0411	0.0	279.63		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	279.63		360		360
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	279.63	43.60	3,739	583	4,322
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	279.63		561		561
Tender (Max)	1	400	400	65%	0.0334	13.4	279.63	43.60	3,739	583	4,322
Tender (Scotty)	1	400	400	65%	0.0334	13.4	279.63	43.60	3,739	583	4,322
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	279.63		1,309		1,309
Tractor	1	80	80	65%	0.0334	2.7	279.63		748		748
Crissafully Pump	1	160	160	90%	0.0463	7.4	279.63		2,071		2,071
Anchor Barge	3	125	375	20%	0.0103	3.9	279.63		1,079		1,079
Crane	1	125	125	40%	0.0206	2.6	279.63		719		719
Light Plants	2	25	50	85%	0.0437	2.2	279.63	43.60	611	95	706
									32,019	2,427	**34,446**

20,000 CY & 8,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	20,000	CY
High Production Rate (Hyd. Dredging) =	192	CY/hr
High Production Rate (Mech. Dredging) =	62	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.5	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	322.58		4,626		4,626
M/V LaSalle	2	400	800	60%	0.0309	24.7	322.58	100.83	7,963	2,489	10,452
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	322.58	100.83	863	270	1,132
Dozer (D6T)	1	200	200	70%	0.0360	7.2	322.58		2,323		2,323
Dozer (950G)	1	183	183	70%	0.0360	6.6	322.58		2,125		2,125
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	322.58	100.83	4,853	1,517	6,369
									22,752	4,275	**27,028**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	157.29		6,213		6,213
Cutter Head Engine	1	200	200	80%	0.0411	8.2	157.29		1,294		1,294
Booster Pumps	0	700	0	80%	0.0411	0.0	157.29		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	157.29		202		202
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	157.29	43.60	2,103	583	2,686
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	157.29		315		315
Tender (Max)	1	400	400	65%	0.0334	13.4	157.29	43.60	2,103	583	2,686
Tender (Scotty)	1	400	400	65%	0.0334	13.4	157.29	43.60	2,103	583	2,686
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	157.29		736		736
Tractor	1	80	80	65%	0.0334	2.7	157.29		421		421
Crissafully Pump	1	160	160	90%	0.0463	7.4	157.29		1,165		1,165
Anchor Barge	3	125	375	20%	0.0103	3.9	157.29		607		607
Crane	1	125	125	40%	0.0206	2.6	157.29		404		404
Light Plants	2	25	50	85%	0.0437	2.2	157.29	43.60	344	95	439
									18,011	2,427	**20,438**

20,000 CY & 10,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 20,000 CY
Low Production Rate (Hyd. Dredging) = 51 CY/hr
Low Production Rate (Mech. Dredging) = 20 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 0 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 1

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 1.9 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	1,000.00		14,341		14,341
M/V LaSalle	2	400	800	60%	0.0309	24.7	1,000.00	118.45	24,686	2,924	27,610
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	1,000.00	118.45	2,674	317	2,991
Dozer (D6T)	1	200	200	70%	0.0360	7.2	1,000.00		7,200		7,200
Dozer (950G)	1	183	183	70%	0.0360	6.6	1,000.00		6,588		6,588
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	1,000.00	118.45	15,043	1,782	16,825
									70,532	5,023	**75,554**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	592.16		23,389		23,389
Cutter Head Engine	1	200	200	80%	0.0411	8.2	592.16		4,873		4,873
Booster Pumps	1	700	700	80%	0.0411	28.8	592.16		17,054		17,054
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	592.16		761		761
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	592.16	43.60	7,918	583	8,501
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	592.16		1,188		1,188
Tender (Max)	1	400	400	65%	0.0334	13.4	592.16	43.60	7,918	583	8,501
Tender (Scotty)	1	400	400	65%	0.0334	13.4	592.16	43.60	7,918	583	8,501
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	592.16		2,771		2,771
Tractor	1	80	80	65%	0.0334	2.7	592.16		1,584		1,584
Crissafully Pump	1	160	160	90%	0.0463	7.4	592.16		4,385		4,385
Anchor Barge	3	125	375	20%	0.0103	3.9	592.16		2,284		2,284
Crane	1	125	125	40%	0.0206	2.6	592.16		1,523		1,523
Light Plants	2	25	50	85%	0.0437	2.2	592.16	43.60	1,294	95	1,390
									84,859	2,427	**87,287**

20,000 CY & 10,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	20,000	CY
Average Production Rate (Hyd. Dredging) =	108	CY/hr
Average Production Rate (Mech. Dredging) =	36	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.9	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	555.56		7,967		7,967
M/V LaSalle	2	400	800	60%	0.0309	24.7	555.56	118.45	13,714	2,924	16,638
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	555.56	118.45	1,486	317	1,802
Dozer (D6T)	1	200	200	70%	0.0360	7.2	555.56		4,000		4,000
Dozer (950G)	1	183	183	70%	0.0360	6.6	555.56		3,660		3,660
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	555.56	118.45	8,357	1,782	10,139
									39,184	5,023	**44,207**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	279.63		11,045		11,045
Cutter Head Engine	1	200	200	80%	0.0411	8.2	279.63		2,301		2,301
Booster Pumps	1	700	700	80%	0.0411	28.8	279.63		8,053		8,053
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	279.63		360		360
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	279.63	43.60	3,739	583	4,322
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	279.63		561		561
Tender (Max)	1	400	400	65%	0.0334	13.4	279.63	43.60	3,739	583	4,322
Tender (Scotty)	1	400	400	65%	0.0334	13.4	279.63	43.60	3,739	583	4,322
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	279.63		1,309		1,309
Tractor	1	80	80	65%	0.0334	2.7	279.63		748		748
Crissafully Pump	1	160	160	90%	0.0463	7.4	279.63		2,071		2,071
Anchor Barge	3	125	375	20%	0.0103	3.9	279.63		1,079		1,079
Crane	1	125	125	40%	0.0206	2.6	279.63		719		719
Light Plants	2	25	50	85%	0.0437	2.2	279.63	43.60	611	95	706
									40,073	2,427	**42,500**

20,000 CY & 10,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	20,000	CY
High Production Rate (Hyd. Dredging) =	192	CY/hr
High Production Rate (Mech. Dredging) =	62	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.9	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	322.58		4,626		4,626
M/V LaSalle	2	400	800	60%	0.0309	24.7	322.58	118.45	7,963	2,924	10,887
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	322.58	118.45	863	317	1,179
Dozer (D6T)	1	200	200	70%	0.0360	7.2	322.58		2,323		2,323
Dozer (950G)	1	183	183	70%	0.0360	6.6	322.58		2,125		2,125
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	322.58	118.45	4,853	1,782	6,634
									22,752	5,023	**27,775**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	157.29		6,213		6,213
Cutter Head Engine	1	200	200	80%	0.0411	8.2	157.29		1,294		1,294
Booster Pumps	1	700	700	80%	0.0411	28.8	157.29		4,530		4,530
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	157.29		202		202
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	157.29	43.60	2,103	583	2,686
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	157.29		315		315
Tender (Max)	1	400	400	65%	0.0334	13.4	157.29	43.60	2,103	583	2,686
Tender (Scotty)	1	400	400	65%	0.0334	13.4	157.29	43.60	2,103	583	2,686
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	157.29		736		736
Tractor	1	80	80	65%	0.0334	2.7	157.29		421		421
Crissafully Pump	1	160	160	90%	0.0463	7.4	157.29		1,165		1,165
Anchor Barge	3	125	375	20%	0.0103	3.9	157.29		607		607
Crane	1	125	125	40%	0.0206	2.6	157.29		404		404
Light Plants	2	25	50	85%	0.0437	2.2	157.29	43.60	344	95	439
									22,541	2,427	**24,968**

20,000 CY & 12,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	20,000	CY
Low Production Rate (Hyd. Dredging) =	51	CY/hr
Low Production Rate (Mech. Dredging) =	20	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	2.3	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	1,000.00		14,341		14,341
M/V LaSalle	2	400	800	60%	0.0309	24.7	1,000.00	136.07	24,686	3,359	28,045
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	1,000.00	136.07	2,674	364	3,038
Dozer (D6T)	1	200	200	70%	0.0360	7.2	1,000.00		7,200		7,200
Dozer (950G)	1	183	183	70%	0.0360	6.6	1,000.00		6,588		6,588
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	1,000.00	136.07	15,043	2,047	17,090
									70,532	5,770	**76,302**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	592.16		23,389		23,389
Cutter Head Engine	1	200	200	80%	0.0411	8.2	592.16		4,873		4,873
Booster Pumps	2	700	1400	80%	0.0411	57.6	592.16		34,108		34,108
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	592.16		761		761
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	592.16	43.60	7,918	583	8,501
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	592.16		1,188		1,188
Tender (Max)	1	400	400	65%	0.0334	13.4	592.16	43.60	7,918	583	8,501
Tender (Scotty)	1	400	400	65%	0.0334	13.4	592.16	43.60	7,918	583	8,501
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	592.16		2,771		2,771
Tractor	1	80	80	65%	0.0334	2.7	592.16		1,584		1,584
Crissafully Pump	1	160	160	90%	0.0463	7.4	592.16		4,385		4,385
Anchor Barge	3	125	375	20%	0.0103	3.9	592.16		2,284		2,284
Crane	1	125	125	40%	0.0206	2.6	592.16		1,523		1,523
Light Plants	2	25	50	85%	0.0437	2.2	592.16	43.60	1,294	95	1,390
									101,914	2,427	**104,341**

20,000 CY & 12,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 20,000 CY
Average Production Rate (Hyd. Dredging) = 108 CY/hr
Average Production Rate (Mech. Dredging) = 36 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 0 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 1

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 2.3 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	555.56		7,967		7,967
M/V LaSalle	2	400	800	60%	0.0309	24.7	555.56	136.07	13,714	3,359	17,073
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	555.56	136.07	1,486	364	1,850
Dozer (D6T)	1	200	200	70%	0.0360	7.2	555.56		4,000		4,000
Dozer (950G)	1	183	183	70%	0.0360	6.6	555.56		3,660		3,660
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	555.56	136.07	8,357	2,047	10,404
									39,184	5,770	**44,954**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	279.63		11,045		11,045
Cutter Head Engine	1	200	200	80%	0.0411	8.2	279.63		2,301		2,301
Booster Pumps	2	700	1400	80%	0.0411	57.6	279.63		16,107		16,107
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	279.63		360		360
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	279.63	43.60	3,739	583	4,322
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	279.63		561		561
Tender (Max)	1	400	400	65%	0.0334	13.4	279.63	43.60	3,739	583	4,322
Tender (Scotty)	1	400	400	65%	0.0334	13.4	279.63	43.60	3,739	583	4,322
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	279.63		1,309		1,309
Tractor	1	80	80	65%	0.0334	2.7	279.63		748		748
Crissafully Pump	1	160	160	90%	0.0463	7.4	279.63		2,071		2,071
Anchor Barge	3	125	375	20%	0.0103	3.9	279.63		1,079		1,079
Crane	1	125	125	40%	0.0206	2.6	279.63		719		719
Light Plants	2	25	50	85%	0.0437	2.2	279.63	43.60	611	95	706
									48,126	2,427	**50,553**

20,000 CY & 12,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 20,000 CY
High Production Rate (Hyd. Dredging) = 192 CY/hr
High Production Rate (Mech. Dredging) = 62 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 0 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 1

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 2.3 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	322.58		4,626		4,626
M/V LaSalle	2	400	800	60%	0.0309	24.7	322.58	136.07	7,963	3,359	11,322
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	322.58	136.07	863	364	1,227
Dozer (D6T)	1	200	200	70%	0.0360	7.2	322.58		2,323		2,323
Dozer (950G)	1	183	183	70%	0.0360	6.6	322.58		2,125		2,125
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	322.58	136.07	4,853	2,047	6,899
									22,752	5,770	**28,522**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	157.29		6,213		6,213
Cutter Head Engine	1	200	200	80%	0.0411	8.2	157.29		1,294		1,294
Booster Pumps	2	700	1400	80%	0.0411	57.6	157.29		9,060		9,060
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	157.29		202		202
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	157.29	43.60	2,103	583	2,686
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	157.29		315		315
Tender (Max)	1	400	400	65%	0.0334	13.4	157.29	43.60	2,103	583	2,686
Tender (Scotty)	1	400	400	65%	0.0334	13.4	157.29	43.60	2,103	583	2,686
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	157.29		736		736
Tractor	1	80	80	65%	0.0334	2.7	157.29		421		421
Crissafully Pump	1	160	160	90%	0.0463	7.4	157.29		1,165		1,165
Anchor Barge	3	125	375	20%	0.0103	3.9	157.29		607		607
Crane	1	125	125	40%	0.0206	2.6	157.29		404		404
Light Plants	2	25	50	85%	0.0437	2.2	157.29	43.60	344	95	439
									27,071	2,427	**29,498**

20,000 CY & 16,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	20,000	CY
Low Production Rate (Hyd. Dredging) =	51	CY/hr
Low Production Rate (Mech. Dredging) =	20	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	1.5	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	2	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	3.0	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	1,000.00		14,341		14,341
M/V LaSalle	2	400	800	60%	0.0309	24.7	1,000.00	166.91	24,686	4,120	28,806
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	1,000.00	166.91	2,674	446	3,121
Dozer (D6T)	1	200	200	70%	0.0360	7.2	1,000.00		7,200		7,200
Dozer (950G)	1	183	183	70%	0.0360	6.6	1,000.00		6,588		6,588
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	1,000.00	166.91	15,043	2,511	17,554
									70,532	7,077	**77,609**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	1,184.31		46,777		46,777
Cutter Head Engine	1	200	200	80%	0.0411	8.2	1,184.31		9,745		9,745
Booster Pumps	0	700	0	80%	0.0411	0.0	1,184.31		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	1,184.31		1,523		1,523
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	1,184.31	44.20	15,836	591	16,427
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	1,184.31		2,375		2,375
Tender (Max)	1	400	400	65%	0.0334	13.4	1,184.31	44.20	15,836	591	16,427
Tender (Scotty)	1	400	400	65%	0.0334	13.4	1,184.31	44.20	15,836	591	16,427
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		44.20		591	591
Tractor	1	140	140	65%	0.0334	4.7	1,184.31		5,543		5,543
Tractor	1	80	80	65%	0.0334	2.7	1,184.31		3,167		3,167
Crissafully Pump	1	160	160	90%	0.0463	7.4	1,184.31		8,771		8,771
Anchor Barge	3	125	375	20%	0.0103	3.9	1,184.31		4,568		4,568
Crane	1	125	125	40%	0.0206	2.6	1,184.31		3,045		3,045
Light Plants	2	25	50	85%	0.0437	2.2	1,184.31	44.20	2,589	97	2,685
									135,611	2,461	**138,071**

20,000 CY & 16,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 20,000 CY
Average Production Rate (Hyd. Dredging) = 108 CY/hr
Average Production Rate (Mech. Dredging) = 36 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 1.5 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 2

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 3.0 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	555.56		7,967		7,967
M/V LaSalle	2	400	800	60%	0.0309	24.7	555.56	166.91	13,714	4,120	17,835
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	555.56	166.91	1,486	446	1,932
Dozer (D6T)	1	200	200	70%	0.0360	7.2	555.56		4,000		4,000
Dozer (950G)	1	183	183	70%	0.0360	6.6	555.56		3,660		3,660
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	555.56	166.91	8,357	2,511	10,868
									39,184	7,077	**46,262**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	559.26		22,089		22,089
Cutter Head Engine	1	200	200	80%	0.0411	8.2	559.26		4,602		4,602
Booster Pumps	0	700	0	80%	0.0411	0.0	559.26		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	559.26		719		719
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	559.26	44.20	7,478	591	8,069
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	559.26		1,122		1,122
Tender (Max)	1	400	400	65%	0.0334	13.4	559.26	44.20	7,478	591	8,069
Tender (Scotty)	1	400	400	65%	0.0334	13.4	559.26	44.20	7,478	591	8,069
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		44.20		591	591
Tractor	1	140	140	65%	0.0334	4.7	559.26		2,617		2,617
Tractor	1	80	80	65%	0.0334	2.7	559.26		1,496		1,496
Crissafully Pump	1	160	160	90%	0.0463	7.4	559.26		4,142		4,142
Anchor Barge	3	125	375	20%	0.0103	3.9	559.26		2,157		2,157
Crane	1	125	125	40%	0.0206	2.6	559.26		1,438		1,438
Light Plants	2	25	50	85%	0.0437	2.2	559.26	44.20	1,222	97	1,319
									64,038	2,461	**66,499**

20,000 CY & 16,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 20,000 CY
High Production Rate (Hyd. Dredging) = 192 CY/hr
High Production Rate (Mech. Dredging) = 62 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 1.5 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 2

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 3.0 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	322.58		4,626		4,626
M/V LaSalle	2	400	800	60%	0.0309	24.7	322.58	166.91	7,963	4,120	12,083
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	322.58	166.91	863	446	1,309
Dozer (D6T)	1	200	200	70%	0.0360	7.2	322.58		2,323		2,323
Dozer (950G)	1	183	183	70%	0.0360	6.6	322.58		2,125		2,125
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	322.58	166.91	4,853	2,511	7,363
									22,752	7,077	**29,830**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	314.58		12,425		12,425
Cutter Head Engine	1	200	200	80%	0.0411	8.2	314.58		2,589		2,589
Booster Pumps	0	700	0	80%	0.0411	0.0	314.58		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	314.58		404		404
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	314.58	44.20	4,206	591	4,797
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	314.58		631		631
Tender (Max)	1	400	400	65%	0.0334	13.4	314.58	44.20	4,206	591	4,797
Tender (Scotty)	1	400	400	65%	0.0334	13.4	314.58	44.20	4,206	591	4,797
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		44.20		591	591
Tractor	1	140	140	65%	0.0334	4.7	314.58		1,472		1,472
Tractor	1	80	80	65%	0.0334	2.7	314.58		841		841
Crissafully Pump	1	160	160	90%	0.0463	7.4	314.58		2,330		2,330
Anchor Barge	3	125	375	20%	0.0103	3.9	314.58		1,213		1,213
Crane	1	125	125	40%	0.0206	2.6	314.58		809		809
Light Plants	2	25	50	85%	0.0437	2.2	314.58	44.20	688	97	784
									36,022	2,461	**38,482**

100,000 CY & 8,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	100,000	CY
Low Production Rate (Hyd. Dredging) =	51	CY/hr
Low Production Rate (Mech. Dredging) =	20	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.5	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	5,000.00		71,704		71,704
M/V LaSalle	2	400	800	60%	0.0309	24.7	5,000.00	365.15	123,429	9,014	132,442
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	5,000.00	365.15	13,371	977	14,348
Dozer (D6T)	1	200	200	70%	0.0360	7.2	5,000.00		36,000		36,000
Dozer (950G)	1	183	183	70%	0.0360	6.6	5,000.00		32,940		32,940
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	5,000.00	365.15	75,214	5,493	80,707
									352,659	15,483	**368,142**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	2,960.78		116,943		116,943
Cutter Head Engine	1	200	200	80%	0.0411	8.2	2,960.78		24,363		24,363
Booster Pumps	0	700	0	80%	0.0411	0.0	2,960.78		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	2,960.78		3,807		3,807
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	2,960.78	43.60	39,590	583	40,173
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	2,960.78		5,938		5,938
Tender (Max)	1	400	400	65%	0.0334	13.4	2,960.78	43.60	39,590	583	40,173
Tender (Scotty)	1	400	400	65%	0.0334	13.4	2,960.78	43.60	39,590	583	40,173
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	2,960.78		13,856		13,856
Tractor	1	80	80	65%	0.0334	2.7	2,960.78		7,918		7,918
Crissafully Pump	1	160	160	90%	0.0463	7.4	2,960.78		21,927		21,927
Anchor Barge	3	125	375	20%	0.0103	3.9	2,960.78		11,420		11,420
Crane	1	125	125	40%	0.0206	2.6	2,960.78		7,613		7,613
Light Plants	2	25	50	85%	0.0437	2.2	2,960.78	43.60	6,471	95	6,567
									339,027	2,427	**341,454**

100,000 CY & 8,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	100,000	CY
Average Production Rate (Hyd. Dredging) =	108	CY/hr
Average Production Rate (Mech. Dredging) =	36	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.5	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	2,777.78		39,836		39,836
M/V LaSalle	2	400	800	60%	0.0309	24.7	2,777.78	365.15	68,571	9,014	77,585
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	2,777.78	365.15	7,429	977	8,405
Dozer (D6T)	1	200	200	70%	0.0360	7.2	2,777.78		20,000		20,000
Dozer (950G)	1	183	183	70%	0.0360	6.6	2,777.78		18,300		18,300
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	2,777.78	365.15	41,786	5,493	47,279
									195,921	15,483	**211,405**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	1,398.15		55,223		55,223
Cutter Head Engine	1	200	200	80%	0.0411	8.2	1,398.15		11,505		11,505
Booster Pumps	0	700	0	80%	0.0411	0.0	1,398.15		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	1,398.15		1,798		1,798
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	1,398.15	43.60	18,695	583	19,278
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	1,398.15		2,804		2,804
Tender (Max)	1	400	400	65%	0.0334	13.4	1,398.15	43.60	18,695	583	19,278
Tender (Scotty)	1	400	400	65%	0.0334	13.4	1,398.15	43.60	18,695	583	19,278
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	1,398.15		6,543		6,543
Tractor	1	80	80	65%	0.0334	2.7	1,398.15		3,739		3,739
Crissafully Pump	1	160	160	90%	0.0463	7.4	1,398.15		10,354		10,354
Anchor Barge	3	125	375	20%	0.0103	3.9	1,398.15		5,393		5,393
Crane	1	125	125	40%	0.0206	2.6	1,398.15		3,595		3,595
Light Plants	2	25	50	85%	0.0437	2.2	1,398.15	43.60	3,056	95	3,151
									160,096	2,427	**162,523**

100,000 CY & 8,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	100,000	CY
High Production Rate (Hyd. Dredging) =	192	CY/hr
High Production Rate (Mech. Dredging) =	62	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.5	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	1,612.90		23,130		23,130
M/V LaSalle	2	400	800	60%	0.0309	24.7	1,612.90	365.15	39,816	9,014	48,830
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	1,612.90	365.15	4,313	977	5,290
Dozer (D6T)	1	200	200	70%	0.0360	7.2	1,612.90		11,613		11,613
Dozer (950G)	1	183	183	70%	0.0360	6.6	1,612.90		10,626		10,626
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	1,612.90	365.15	24,263	5,493	29,756
									113,761	15,483	**129,244**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	786.46		31,063		31,063
Cutter Head Engine	1	200	200	80%	0.0411	8.2	786.46		6,471		6,471
Booster Pumps	0	700	0	80%	0.0411	0.0	786.46		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	786.46		1,011		1,011
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	786.46	43.60	10,516	583	11,099
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	786.46		1,577		1,577
Tender (Max)	1	400	400	65%	0.0334	13.4	786.46	43.60	10,516	583	11,099
Tender (Scotty)	1	400	400	65%	0.0334	13.4	786.46	43.60	10,516	583	11,099
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	786.46		3,681		3,681
Tractor	1	80	80	65%	0.0334	2.7	786.46		2,103		2,103
Crissafully Pump	1	160	160	90%	0.0463	7.4	786.46		5,824		5,824
Anchor Barge	3	125	375	20%	0.0103	3.9	786.46		3,033		3,033
Crane	1	125	125	40%	0.0206	2.6	786.46		2,022		2,022
Light Plants	2	25	50	85%	0.0437	2.2	786.46	43.60	1,719	95	1,814
									90,054	2,427	**92,481**

100,000 CY & 10,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	100,000	CY
Low Production Rate (Hyd. Dredging) =	51	CY/hr
Low Production Rate (Mech. Dredging) =	20	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.9	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	5,000.00		71,704		71,704
M/V LaSalle	2	400	800	60%	0.0309	24.7	5,000.00	453.25	123,429	11,189	134,617
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	5,000.00	453.25	13,371	1,212	14,584
Dozer (D6T)	1	200	200	70%	0.0360	7.2	5,000.00		36,000		36,000
Dozer (950G)	1	183	183	70%	0.0360	6.6	5,000.00		32,940		32,940
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	5,000.00	453.25	75,214	6,818	82,032
									352,659	19,219	**371,878**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	2,960.78		116,943		116,943
Cutter Head Engine	1	200	200	80%	0.0411	8.2	2,960.78		24,363		24,363
Booster Pumps	1	700	700	80%	0.0411	28.8	2,960.78		85,271		85,271
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	2,960.78		3,807		3,807
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	2,960.78	43.60	39,590	583	40,173
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	2,960.78		5,938		5,938
Tender (Max)	1	400	400	65%	0.0334	13.4	2,960.78	43.60	39,590	583	40,173
Tender (Scotty)	1	400	400	65%	0.0334	13.4	2,960.78	43.60	39,590	583	40,173
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	2,960.78		13,856		13,856
Tractor	1	80	80	65%	0.0334	2.7	2,960.78		7,918		7,918
Crissafully Pump	1	160	160	90%	0.0463	7.4	2,960.78		21,927		21,927
Anchor Barge	3	125	375	20%	0.0103	3.9	2,960.78		11,420		11,420
Crane	1	125	125	40%	0.0206	2.6	2,960.78		7,613		7,613
Light Plants	2	25	50	85%	0.0437	2.2	2,960.78	43.60	6,471	95	6,567
									424,297	2,427	**426,725**

100,000 CY & 10,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	100,000	CY
Average Production Rate (Hyd. Dredging) =	108	CY/hr
Average Production Rate (Mech. Dredging) =	36	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	1.9	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	2,777.78		39,836		39,836
M/V LaSalle	2	400	800	60%	0.0309	24.7	2,777.78	453.25	68,571	11,189	79,760
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	2,777.78	453.25	7,429	1,212	8,641
Dozer (D6T)	1	200	200	70%	0.0360	7.2	2,777.78		20,000		20,000
Dozer (950G)	1	183	183	70%	0.0360	6.6	2,777.78		18,300		18,300
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	2,777.78	453.25	41,786	6,818	48,604
									195,921	19,219	**215,141**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	1,398.15		55,223		55,223
Cutter Head Engine	1	200	200	80%	0.0411	8.2	1,398.15		11,505		11,505
Booster Pumps	1	700	700	80%	0.0411	28.8	1,398.15		40,267		40,267
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	1,398.15		1,798		1,798
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	1,398.15	43.60	18,695	583	19,278
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	1,398.15		2,804		2,804
Tender (Max)	1	400	400	65%	0.0334	13.4	1,398.15	43.60	18,695	583	19,278
Tender (Scotty)	1	400	400	65%	0.0334	13.4	1,398.15	43.60	18,695	583	19,278
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	1,398.15		6,543		6,543
Tractor	1	80	80	65%	0.0334	2.7	1,398.15		3,739		3,739
Crissafully Pump	1	160	160	90%	0.0463	7.4	1,398.15		10,354		10,354
Anchor Barge	3	125	375	20%	0.0103	3.9	1,398.15		5,393		5,393
Crane	1	125	125	40%	0.0206	2.6	1,398.15		3,595		3,595
Light Plants	2	25	50	85%	0.0437	2.2	1,398.15	43.60	3,056	95	3,151
									200,363	2,427	**202,790**

100,000 CY & 10,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 100,000 CY
High Production Rate (Hyd. Dredging) = 192 CY/hr
High Production Rate (Mech. Dredging) = 62 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 0 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 1

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 1.9 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	1,612.90		23,130		23,130
M/V LaSalle	2	400	800	60%	0.0309	24.7	1,612.90	453.25	39,816	11,189	51,005
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	1,612.90	453.25	4,313	1,212	5,525
Dozer (D6T)	1	200	200	70%	0.0360	7.2	1,612.90		11,613		11,613
Dozer (950G)	1	183	183	70%	0.0360	6.6	1,612.90		10,626		10,626
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	1,612.90	453.25	24,263	6,818	31,081
									113,761	19,219	**132,980**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	786.46		31,063		31,063
Cutter Head Engine	1	200	200	80%	0.0411	8.2	786.46		6,471		6,471
Booster Pumps	1	700	700	80%	0.0411	28.8	786.46		22,650		22,650
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	786.46		1,011		1,011
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	786.46	43.60	10,516	583	11,099
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	786.46		1,577		1,577
Tender (Max)	1	400	400	65%	0.0334	13.4	786.46	43.60	10,516	583	11,099
Tender (Scotty)	1	400	400	65%	0.0334	13.4	786.46	43.60	10,516	583	11,099
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	786.46		3,681		3,681
Tractor	1	80	80	65%	0.0334	2.7	786.46		2,103		2,103
Crissafully Pump	1	160	160	90%	0.0463	7.4	786.46		5,824		5,824
Anchor Barge	3	125	375	20%	0.0103	3.9	786.46		3,033		3,033
Crane	1	125	125	40%	0.0206	2.6	786.46		2,022		2,022
Light Plants	2	25	50	85%	0.0437	2.2	786.46	43.60	1,719	95	1,814
									112,704	2,427	**115,131**

100,000 CY & 12,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	100,000	CY
Low Production Rate (Hyd. Dredging) =	51	CY/hr
Low Production Rate (Mech. Dredging) =	20	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	2.3	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	5,000.00		71,704		71,704
M/V LaSalle	2	400	800	60%	0.0309	24.7	5,000.00	541.36	123,429	13,364	136,792
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	5,000.00	541.36	13,371	1,448	14,819
Dozer (D6T)	1	200	200	70%	0.0360	7.2	5,000.00		36,000		36,000
Dozer (950G)	1	183	183	70%	0.0360	6.6	5,000.00		32,940		32,940
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	5,000.00	541.36	75,214	8,144	83,358
									352,659	22,955	**375,614**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	2,960.78		116,943		116,943
Cutter Head Engine	1	200	200	80%	0.0411	8.2	2,960.78		24,363		24,363
Booster Pumps	2	700	1400	80%	0.0411	57.6	2,960.78		170,541		170,541
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	2,960.78		3,807		3,807
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	2,960.78	43.60	39,590	583	40,173
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	2,960.78		5,938		5,938
Tender (Max)	1	400	400	65%	0.0334	13.4	2,960.78	43.60	39,590	583	40,173
Tender (Scotty)	1	400	400	65%	0.0334	13.4	2,960.78	43.60	39,590	583	40,173
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	2,960.78		13,856		13,856
Tractor	1	80	80	65%	0.0334	2.7	2,960.78		7,918		7,918
Crissafully Pump	1	160	160	90%	0.0463	7.4	2,960.78		21,927		21,927
Anchor Barge	3	125	375	20%	0.0103	3.9	2,960.78		11,420		11,420
Crane	1	125	125	40%	0.0206	2.6	2,960.78		7,613		7,613
Light Plants	2	25	50	85%	0.0437	2.2	2,960.78	43.60	6,471	95	6,567
									509,568	2,427	**511,995**

100,000 CY & 12,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 100,000 CY
Average Production Rate (Hyd. Dredging) = 108 CY/hr
Average Production Rate (Mech. Dredging) = 36 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 0 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 1

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 2.3 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	2,777.78		39,836		39,836
M/V LaSalle	2	400	800	60%	0.0309	24.7	2,777.78	541.36	68,571	13,364	81,935
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	2,777.78	541.36	7,429	1,448	8,876
Dozer (D6T)	1	200	200	70%	0.0360	7.2	2,777.78		20,000		20,000
Dozer (950G)	1	183	183	70%	0.0360	6.6	2,777.78		18,300		18,300
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	2,777.78	541.36	41,786	8,144	49,929
									195,921	22,955	**218,877**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	1,398.15		55,223		55,223
Cutter Head Engine	1	200	200	80%	0.0411	8.2	1,398.15		11,505		11,505
Booster Pumps	2	700	1400	80%	0.0411	57.6	1,398.15		80,533		80,533
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	1,398.15		1,798		1,798
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	1,398.15	43.60	18,695	583	19,278
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	1,398.15		2,804		2,804
Tender (Max)	1	400	400	65%	0.0334	13.4	1,398.15	43.60	18,695	583	19,278
Tender (Scotty)	1	400	400	65%	0.0334	13.4	1,398.15	43.60	18,695	583	19,278
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	1,398.15		6,543		6,543
Tractor	1	80	80	65%	0.0334	2.7	1,398.15		3,739		3,739
Crissafully Pump	1	160	160	90%	0.0463	7.4	1,398.15		10,354		10,354
Anchor Barge	3	125	375	20%	0.0103	3.9	1,398.15		5,393		5,393
Crane	1	125	125	40%	0.0206	2.6	1,398.15		3,595		3,595
Light Plants	2	25	50	85%	0.0437	2.2	1,398.15	43.60	3,056	95	3,151
									240,629	2,427	**243,057**

100,000 CY & 12,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour =	0.36	lbs per bhp-hr
Mass of Diesel Fuel per Gallon =	7.0	lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged =	100,000	CY
High Production Rate (Hyd. Dredging) =	192	CY/hr
High Production Rate (Mech. Dredging) =	62	CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) =	109	Miles
Double Handling Mob Distance (Hyd. Dredging) =	0	Miles
Average Transport Speed (Hyd Dredging) =	2.5	Miles/hr
Times Material is Dredged (Hyd Dredging) =	1	
Average Mobilization Distance (Mech. Dredging) =	139.0	Miles
Average Transport Distance (Dredged Material) =	2.3	Miles/trip
Average Transport Speed (Mech Dredging) =	4.0	Miles/hr
Average Barge Capacity =	227	CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	1,612.90		23,130		23,130
M/V LaSalle	2	400	800	60%	0.0309	24.7	1,612.90	541.36	39,816	13,364	53,179
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	1,612.90	541.36	4,313	1,448	5,761
Dozer (D6T)	1	200	200	70%	0.0360	7.2	1,612.90		11,613		11,613
Dozer (950G)	1	183	183	70%	0.0360	6.6	1,612.90		10,626		10,626
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	1,612.90	541.36	24,263	8,144	32,406
									113,761	22,955	**136,716**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	786.46		31,063		31,063
Cutter Head Engine	1	200	200	80%	0.0411	8.2	786.46		6,471		6,471
Booster Pumps	2	700	1400	80%	0.0411	57.6	786.46		45,300		45,300
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	786.46		1,011		1,011
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	786.46	43.60	10,516	583	11,099
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	786.46		1,577		1,577
Tender (Max)	1	400	400	65%	0.0334	13.4	786.46	43.60	10,516	583	11,099
Tender (Scotty)	1	400	400	65%	0.0334	13.4	786.46	43.60	10,516	583	11,099
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		43.60		583	583
Tractor	1	140	140	65%	0.0334	4.7	786.46		3,681		3,681
Tractor	1	80	80	65%	0.0334	2.7	786.46		2,103		2,103
Crissafully Pump	1	160	160	90%	0.0463	7.4	786.46		5,824		5,824
Anchor Barge	3	125	375	20%	0.0103	3.9	786.46		3,033		3,033
Crane	1	125	125	40%	0.0206	2.6	786.46		2,022		2,022
Light Plants	2	25	50	85%	0.0437	2.2	786.46	43.60	1,719	95	1,814
									135,354	2,427	**137,781**

100,000 CY & 16,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 100,000 CY
Low Production Rate (Hyd. Dredging) = 51 CY/hr
Low Production Rate (Mech. Dredging) = 20 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 1.5 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 2

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 3.0 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	5,000.00		71,704		71,704
M/V LaSalle	2	400	800	60%	0.0309	24.7	5,000.00	695.54	123,429	17,170	140,599
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	5,000.00	695.54	13,371	1,860	15,232
Dozer (D6T)	1	200	200	70%	0.0360	7.2	5,000.00		36,000		36,000
Dozer (950G)	1	183	183	70%	0.0360	6.6	5,000.00		32,940		32,940
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	5,000.00	695.54	75,214	10,463	85,677
									352,659	29,493	**382,152**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	5,921.57		233,885		233,885
Cutter Head Engine	1	200	200	80%	0.0411	8.2	5,921.57		48,726		48,726
Booster Pumps	0	700	0	80%	0.0411	0.0	5,921.57		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	5,921.57		7,613		7,613
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	5,921.57	44.20	79,180	591	79,771
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	5,921.57		11,877		11,877
Tender (Max)	1	400	400	65%	0.0334	13.4	5,921.57	44.20	79,180	591	79,771
Tender (Scotty)	1	400	400	65%	0.0334	13.4	5,921.57	44.20	79,180	591	79,771
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		44.20		591	591
Tractor	1	140	140	65%	0.0334	4.7	5,921.57		27,713		27,713
Tractor	1	80	80	65%	0.0334	2.7	5,921.57		15,836		15,836
Crissafully Pump	1	160	160	90%	0.0463	7.4	5,921.57		43,853		43,853
Anchor Barge	3	125	375	20%	0.0103	3.9	5,921.57		22,840		22,840
Crane	1	125	125	40%	0.0206	2.6	5,921.57		15,227		15,227
Light Plants	2	25	50	85%	0.0437	2.2	5,921.57	44.20	12,943	97	13,039
									678,053	2,461	**680,514**

100,000 CY & 16,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 100,000 CY
Average Production Rate (Hyd. Dredging) = 108 CY/hr
Average Production Rate (Mech. Dredging) = 36 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 1.5 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 2

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 3.0 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	2,777.78		39,836		39,836
M/V LaSalle	2	400	800	60%	0.0309	24.7	2,777.78	695.54	68,571	17,170	85,741
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	2,777.78	695.54	7,429	1,860	9,289
Dozer (D6T)	1	200	200	70%	0.0360	7.2	2,777.78		20,000		20,000
Dozer (950G)	1	183	183	70%	0.0360	6.6	2,777.78		18,300		18,300
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	2,777.78	695.54	41,786	10,463	52,249
									195,921	29,493	**225,414**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	2,796.30		110,446		110,446
Cutter Head Engine	1	200	200	80%	0.0411	8.2	2,796.30		23,010		23,010
Booster Pumps	0	700	0	80%	0.0411	0.0	2,796.30		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	2,796.30		3,595		3,595
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	2,796.30	44.20	37,390	591	37,981
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	2,796.30		5,609		5,609
Tender (Max)	1	400	400	65%	0.0334	13.4	2,796.30	44.20	37,390	591	37,981
Tender (Scotty)	1	400	400	65%	0.0334	13.4	2,796.30	44.20	37,390	591	37,981
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		44.20		591	591
Tractor	1	140	140	65%	0.0334	4.7	2,796.30		13,087		13,087
Tractor	1	80	80	65%	0.0334	2.7	2,796.30		7,478		7,478
Crissafully Pump	1	160	160	90%	0.0463	7.4	2,796.30		20,709		20,709
Anchor Barge	3	125	375	20%	0.0103	3.9	2,796.30		10,786		10,786
Crane	1	125	125	40%	0.0206	2.6	2,796.30		7,190		7,190
Light Plants	2	25	50	85%	0.0437	2.2	2,796.30	44.20	6,112	97	6,209
									320,192	2,461	**322,653**

100,000 CY & 16,000 feet

Fuel used per Horsepower per hour = Rated Horsepower * Fuel Factor

Fuel Factor = (Horsepower Factor * Pounds of Fuel per Horsepower per hour)/Pounds of Fuel per Gallon

Average Diesel Fuel per Horsepower per Hour = 0.36 lbs per bhp-hr
Mass of Diesel Fuel per Gallon = 7.0 lbs per gal

Operation Time (Dredging) = Dredging Time + Passing Vesseltime + Placement Time + Rehandle Time

Total Volume to be Dredged = 100,000 CY
High Production Rate (Hyd. Dredging) = 192 CY/hr
High Production Rate (Mech. Dredging) = 62 CY/hr

Operation Time (Mobilization) = Transport Distance/Transport Speed

Average Mobilization Distance (Hyd. Dredging) = 109 Miles
Double Handling Mob Distance (Hyd. Dredging) = 1.5 Miles
Average Transport Speed (Hyd Dredging) = 2.5 Miles/hr
Times Material is Dredged (Hyd Dredging) = 2

Average Mobilization Distance (Mech. Dredging) = 139.0 Miles
Average Transport Distance (Dredged Material) = 3.0 Miles/trip
Average Transport Speed (Mech Dredging) = 4.0 Miles/hr
Average Barge Capacity = 227 CY/trip

Equipment	Quantity	Rated Horsepower	Total Horsepower	Horsepower Factor	Fuel Factor	Fuel per Hour	Operation Time (Dredging)	Operation Time (Transport)	Fuel Usage (Dredging)	Fuel Usage (Transport)	Fuel Usage (Total)
Mechanical Dredge		*(hp)*	*(hp)*		*(gal/hp-hr)*	*(gal/hr)*	*(hr)*	*(hr)*	*(gal)*	*(gal)*	*(gal)*
Excavator	1	429	429	65%	0.0334	14.3	1,612.90		23,130		23,130
M/V LaSalle	2	400	800	60%	0.0309	24.7	1,612.90	695.54	39,816	17,170	56,986
Gen Set (Lasalle)	1	80	80	65%	0.0334	2.7	1,612.90	695.54	4,313	1,860	6,173
Dozer (D6T)	1	200	200	70%	0.0360	7.2	1,612.90		11,613		11,613
Dozer (950G)	1	183	183	70%	0.0360	6.6	1,612.90		10,626		10,626
Gen Set (Crane Barge)	2	225	450	65%	0.0334	15.0	1,612.90	695.54	24,263	10,463	34,726
									113,761	29,493	**143,254**
Hydraulic Dredge											
Main Engine	1	960	960	80%	0.0411	39.5	1,572.92		62,126		62,126
Cutter Head Engine	1	200	200	80%	0.0411	8.2	1,572.92		12,943		12,943
Booster Pumps	0	700	0	80%	0.0411	0.0	1,572.92		0		0
Spud Hyd Drive Engine	1	125	125	20%	0.0103	1.3	1,572.92		2,022		2,022
Gen Set (Dredge-300kW)	1	400	400	65%	0.0334	13.4	1,572.92	44.20	21,032	591	21,623
Gen Set (Dredge-35kW)	1	60	60	65%	0.0334	2.0	1,572.92		3,155		3,155
Tender (Max)	1	400	400	65%	0.0334	13.4	1,572.92	44.20	21,032	591	21,623
Tender (Scotty)	1	400	400	65%	0.0334	13.4	1,572.92	44.20	21,032	591	21,623
Tender (Debra Ann)-(Mob Only)	1	400	400	65%	0.0334	13.4		44.20		591	591
Tractor	1	140	140	65%	0.0334	4.7	1,572.92		7,361		7,361
Tractor	1	80	80	65%	0.0334	2.7	1,572.92		4,206		4,206
Crissafully Pump	1	160	160	90%	0.0463	7.4	1,572.92		11,649		11,649
Anchor Barge	3	125	375	20%	0.0103	3.9	1,572.92		6,067		6,067
Crane	1	125	125	40%	0.0206	2.6	1,572.92		4,045		4,045
Light Plants	2	25	50	85%	0.0437	2.2	1,572.92	44.20	3,438	97	3,535
									180,108	2,461	**182,569**

APPENDIX C

DREDGING
COST ESTIMATE
CALCULATION TABLES

QUANTITY: 1,000 CY 6/23/2008

DREDGE TYPE	CUT	VOLUME (CU YDS)	EVENT WITH BOOSTER(S)	EVENT WITH NO BOOSTER	TOTAL TRANSPORT (FEET)	REHANDLE (%)	PRODUCTION (CU YDS/HOUR)		DREDGING TIME (HOURS)	PASSING VESSEL TIME CROSSING PIPELINE	PASSING VESSEL TIME NON-CROSSING	PLACEMENT TIME	REHANDLE TIME	TOTAL DREDGING TIME	MOB./DEMOB. TIME	TOTAL TIME	RENTAL RATE PER HOUR	COST/ EVENT	COST / CU YD		
HYD.	# 1	1,000	0	1	8,000	0%	51	Min	19.61	3.73	0.00	6.27	0.00	29.61	43.60	73.21	$698	$51,099	**$51.10**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		1,000	0	1	8,000	0%	108	Avg	9.26	1.76	0.00	2.96	0.00	13.98	43.60	57.58	$698	$40,192	**$40.19**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		1,000	0	1	8,000	0%	192	Max	5.21	0.99	0.00	1.67	0.00	7.86	43.60	51.46	$698	$35,922	**$35.92**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.	# 2	1,000	1	0	10,000	0%	51	Min	19.61	3.73	0.00	6.27	0.00	29.61	43.60	73.21	$698	$51,099	**$51.10**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		1,000	1	0	10,000	0%	108	Avg	9.26	1.76	0.00	2.96	0.00	13.98	43.60	57.58	$698	$40,192	**$40.19**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		1,000	1	0	10,000	0%	192	Max	5.21	0.99	0.00	1.67	0.00	7.86	43.60	51.46	$698	$35,922	**$35.92**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.	# 3	1,000	2	0	12,000	0%	51	Min	19.61	3.73	0.00	6.27	0.00	29.61	43.60	73.21	$698	$51,099	**$51.10**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		1,000	2	0	12,000	0%	108	Avg	9.26	1.76	0.00	2.96	0.00	13.98	43.60	57.58	$698	$40,192	**$40.19**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		1,000	2	0	12,000	0%	192	Max	5.21	0.99	0.00	1.67	0.00	7.86	43.60	51.46	$698	$35,922	**$35.92**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.	# 4	1,000	0	1	16,000	100%	51	Min	19.61	3.73	0.00	6.27	29.61	59.22	44.20	103.42	$698	$72,184	**$72.18**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		1,000	0	1	16,000	100%	108	Avg	9.26	1.76	0.00	2.96	13.98	27.96	44.20	72.16	$698	$50,370	**$50.37**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		1,000	0	1	16,000	100%	192	Max	5.21	0.99	0.00	1.67	7.86	15.73	44.20	59.93	$698	$41,831	**$41.83**	100%	crossing line
										19%	10%	32%								0%	non-crossing line

DREDGE TYPE	CUT	VOLUME (CU YDS)	EVENT WITH BOOSTER(S)	EVENT WITH NO BOOSTER	TOTAL TRANSPORT (FEET)	REHANDLE (%)	PRODUCTION (CU YDS/HOUR)		DREDGING TIME (HOURS)	PASSING VESSEL TIME CROSSING PIPELINE	PASSING VESSEL TIME NON-CROSSING	PLACEMENT TIME	REHANDLE TIME	TOTAL DREDGING TIME	MOB./DEMOB. TIME	TOTAL TIME	RENTAL RATE PER HOUR	COST/ EVENT	COST / CU YD
MECH	# 1	1,000	0	1	8,000	0%	20	Min	50.00	n/a	n/a	n/a	n/a	50.00	34.75	84.75	$665	$56,359	**$56.36**
MECH		1,000	0	1	8,000	0%	36	Avg	27.78	n/a	n/a	n/a	n/a	27.78	34.75	62.53	$665	$41,581	**$41.58**
MECH		1,000	0	1	8,000	0%	62	Max	16.13	n/a	n/a	n/a	n/a	16.13	34.75	50.88	$665	$33,835	**$33.83**
MECH	# 2	1,000	0	1	10,000	0%	20	Min	50.00	n/a	n/a	n/a	n/a	50.00	34.75	84.75	$665	$56,359	**$56.36**
MECH		1,000	0	1	10,000	0%	36	Avg	27.78	n/a	n/a	n/a	n/a	27.78	34.75	62.53	$665	$41,581	**$41.58**
MECH		1,000	0	1	10,000	0%	62	Max	16.13	n/a	n/a	n/a	n/a	16.13	34.75	50.88	$665	$33,835	**$33.83**
MECH	# 3	1,000	0	1	12,000	0%	20	Min	50.00	n/a	n/a	n/a	n/a	50.00	34.75	84.75	$665	$56,359	**$56.36**
MECH		1,000	0	1	12,000	0%	36	Avg	27.78	n/a	n/a	n/a	n/a	27.78	34.75	62.53	$665	$41,581	**$41.58**
MECH		1,000	0	1	12,000	0%	62	Max	16.13	n/a	n/a	n/a	n/a	16.13	34.75	50.88	$665	$33,835	**$33.83**
MECH	# 4	1,000	0	1	16,000	0%	20	Min	50.00	n/a	n/a	n/a	n/a	50.00	34.75	84.75	$665	$56,359	**$56.36**
MECH		1,000	0	1	16,000	0%	36	Avg	27.78	n/a	n/a	n/a	n/a	27.78	34.75	62.53	$665	$41,581	**$41.58**
MECH		1,000	0	1	16,000	0%	62	Max	16.13	n/a	n/a	n/a	n/a	16.13	34.75	50.88	$665	$33,835	**$33.83**
		Hyd. Dredge Production Rates:					Low	51	CY/hr		Mech Dredge Production Rates:					Low	20	CY/hr	
							Avg	108	CY/hr							Avg	36	CY/hr	
							High	192	CY/hr							High	62	CY/hr	
		Rental Rate for Hyd. Dredge						698	$/hr		Rental Rate for Mech Dredge						665	$/hr	

QUANTITY:			**5,000**		**CY**																6/23/2008
DREDGE TYPE	CUT	VOLUME (CU YDS)	EVENT WITH BOOSTER(S)	EVENT WITH NO BOOSTER	TOTAL TRANSPORT (FEET)	REHANDLE (%)	PRODUCTION (CU YDS/HOUR)		DREDGING TIME (HOURS)	PASSING VESSEL TIME CROSSING PIPELINE	PASSING VESSEL TIME NON-CROSSING	PLACEMENT TIME	REHANDLE TIME	TOTAL DREDGING TIME	MOB./DEMOB. TIME	TOTAL TIME	RENTAL RATE PER HOUR	COST/ EVENT	COST / CU YD		
HYD.	# 1	5,000	0	1	8,000	0%	51	Min	98.04	18.63	0.00	31.37	0.00	148.04	43.60	191.64	$698	$133,764	**$26.75**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		5,000	0	1	8,000	0%	108	Avg	46.30	8.80	0.00	14.81	0.00	69.91	43.60	113.51	$698	$79,228	**$15.85**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		5,000	0	1	8,000	0%	192	Max	26.04	4.95	0.00	8.33	0.00	39.32	43.60	82.92	$698	$57,880	**$11.58**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.	# 2	5,000	1	0	10,000	0%	51	Min	98.04	18.63	0.00	31.37	0.00	148.04	43.60	191.64	$698	$133,764	**$26.75**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		5,000	1	0	10,000	0%	108	Avg	46.30	8.80	0.00	14.81	0.00	69.91	43.60	113.51	$698	$79,228	**$15.85**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		5,000	1	0	10,000	0%	192	Max	26.04	4.95	0.00	8.33	0.00	39.32	43.60	82.92	$698	$57,880	**$11.58**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.	# 3	5,000	2	0	12,000	0%	51	Min	98.04	18.63	0.00	31.37	0.00	148.04	43.60	191.64	$698	$133,764	**$26.75**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		5,000	2	0	12,000	0%	108	Avg	46.30	8.80	0.00	14.81	0.00	69.91	43.60	113.51	$698	$79,228	**$15.85**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		5,000	2	0	12,000	0%	192	Max	26.04	4.95	0.00	8.33	0.00	39.32	43.60	82.92	$698	$57,880	**$11.58**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.	# 4	5,000	0	1	16,000	100%	51	Min	98.04	18.63	0.00	31.37	148.04	296.08	44.20	340.28	$698	$237,514	**$47.50**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		5,000	0	1	16,000	100%	108	Avg	46.30	8.80	0.00	14.81	69.91	139.81	44.20	184.01	$698	$128,442	**$25.69**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		5,000	0	1	16,000	100%	192	Max	26.04	4.95	0.00	8.33	39.32	78.65	44.20	122.85	$698	$85,746	**$17.15**	100%	crossing line
										19%	10%	32%								0%	non-crossing line

DREDGE TYPE	CUT	VOLUME (CU YDS)	EVENT WITH BOOSTER(S)	EVENT WITH NO BOOSTER	TOTAL TRANSPORT (FEET)	REHANDLE (%)	PRODUCTION (CU YDS/HOUR)		DREDGING TIME (HOURS)	PASSING VESSEL TIME CROSSING PIPELINE	PASSING VESSEL TIME NON-CROSSING	PLACEMENT TIME	REHANDLE TIME	TOTAL DREDGING TIME	MOB./DEMOB. TIME	TOTAL TIME	RENTAL RATE PER HOUR	COST/ EVENT	COST / CU YD
MECH		5,000	0	1	8,000	0%	36	Avg	138.89	n/a	n/a	n/a	n/a	138.89	34.75	173.64	$665	$115,470	**$23.09**
MECH		5,000	0	1	8,000	0%	62	Max	80.65	n/a	n/a	n/a	n/a	80.65	34.75	115.40	$665	$76,738	**$15.35**
MECH	# 2	5,000	0	1	10,000	0%	20	Min	250.00	n/a	n/a	n/a	n/a	250.00	34.75	284.75	$665	$189,359	**$37.87**
MECH		5,000	0	1	10,000	0%	36	Avg	138.89	n/a	n/a	n/a	n/a	138.89	34.75	173.64	$665	$115,470	**$23.09**
MECH		5,000	0	1	10,000	0%	62	Max	80.65	n/a	n/a	n/a	n/a	80.65	34.75	115.40	$665	$76,738	**$15.35**
MECH	# 3	5,000	0	1	12,000	0%	20	Min	250.00	n/a	n/a	n/a	n/a	250.00	34.75	284.75	$665	$189,359	**$37.87**
MECH		5,000	0	1	12,000	0%	36	Avg	138.89	n/a	n/a	n/a	n/a	138.89	34.75	173.64	$665	$115,470	**$23.09**
MECH		5,000	0	1	12,000	0%	62	Max	80.65	n/a	n/a	n/a	n/a	80.65	34.75	115.40	$665	$76,738	**$15.35**
MECH	# 4	5,000	0	1	16,000	0%	20	Min	250.00	n/a	n/a	n/a	n/a	250.00	34.75	284.75	$665	$189,359	**$37.87**
MECH		5,000	0	1	16,000	0%	36	Avg	138.89	n/a	n/a	n/a	n/a	138.89	34.75	173.64	$665	$115,470	**$23.09**
MECH		5,000	0	1	16,000	0%	62	Max	80.65	n/a	n/a	n/a	n/a	80.65	34.75	115.40	$665	$76,738	**$15.35**
		Hyd. Dredge Production Rates:					Low	51	CY/hr		Mech Dredge Production Rates:					Low	20	CY/hr	
							Avg	108	CY/hr							Avg	36	CY/hr	
							High	192	CY/hr							High	62	CY/hr	
		Rental Rate for Hyd. Dredge						698	$/hr		Rental Rate for Mech Dredge						665	$/hr	

QUANTITY: 20,000 CY 6/23/2008

DREDGE TYPE	CUT	VOLUME (CU YDS)	EVENT WITH BOOSTER(S)	EVENT WITH NO BOOSTER	TOTAL TRANSPORT (FEET)	REHANDLE (%)	PRODUCTION (CU YDS/HOUR)		DREDGING TIME (HOURS)	PASSING VESSEL TIME CROSSING PIPELINE	PASSING VESSEL TIME NON-CROSSING	PLACEMENT TIME	REHANDLE TIME	TOTAL DREDGING TIME	MOB./DEMOB. TIME	TOTAL TIME	RENTAL RATE PER HOUR	COST/ EVENT	COST / CU YD		
HYD.	# 1	20,000	0	1	8,000	0%	51	Min	392.16	74.51	0.00	125.49	0.00	592.16	43.60	635.76	$698	$443,758	**$22.19**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		20,000	0	1	8,000	0%	108	Avg	185.19	35.19	0.00	59.26	0.00	279.63	43.60	323.23	$698	$225,614	**$11.28**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		20,000	0	1	8,000	0%	192	Max	104.17	19.79	0.00	33.33	0.00	157.29	43.60	200.89	$698	$140,222	**$7.01**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.	# 2	20,000	1	0	10,000	0%	51	Min	392.16	74.51	0.00	125.49	0.00	592.16	43.60	635.76	$698	$443,758	**$22.19**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		20,000	1	0	10,000	0%	108	Avg	185.19	35.19	0.00	59.26	0.00	279.63	43.60	323.23	$698	$225,614	**$11.28**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		20,000	1	0	10,000	0%	192	Max	104.17	19.79	0.00	33.33	0.00	157.29	43.60	200.89	$698	$140,222	**$7.01**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.	# 3	20,000	2	0	12,000	0%	51	Min	392.16	74.51	0.00	125.49	0.00	592.16	43.60	635.76	$698	$443,758	**$22.19**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		20,000	2	0	12,000	0%	108	Avg	185.19	35.19	0.00	59.26	0.00	279.63	43.60	323.23	$698	$225,614	**$11.28**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		20,000	2	0	12,000	0%	192	Max	104.17	19.79	0.00	33.33	0.00	157.29	43.60	200.89	$698	$140,222	**$7.01**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.	# 4	20,000	0	1	16,000	100%	51	Min	392.16	74.51	0.00	125.49	592.16	1184.31	44.20	1228.51	$698	$857,503	**$42.88**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		20,000	0	1	16,000	100%	108	Avg	185.19	35.19	0.00	59.26	279.63	559.26	44.20	603.46	$698	$421,215	**$21.06**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		20,000	0	1	16,000	100%	192	Max	104.17	19.79	0.00	33.33	157.29	314.58	44.20	358.78	$698	$250,431	**$12.52**	100%	crossing line
										19%	10%	32%								0%	non-crossing line

DREDGE TYPE	CUT	VOLUME (CU YDS)	EVENT WITH BOOSTER(S)	EVENT WITH NO BOOSTER	TOTAL TRANSPORT (FEET)	REHANDLE (%)	PRODUCTION (CU YDS/HOUR)		DREDGING TIME (HOURS)	PASSING VESSEL TIME CROSSING PIPELINE	PASSING VESSEL TIME NON-CROSSING	PLACEMENT TIME	REHANDLE TIME	TOTAL DREDGING TIME	MOB./DEMOB. TIME	TOTAL TIME	RENTAL RATE PER HOUR	COST/ EVENT	COST / CU YD
MECH		20,000	0	1	8,000	0%	36	Avg	555.56	n/a	n/a	n/a	n/a	555.56	34.75	590.31	$665	$392,553	**$19.63**
MECH		20,000	0	1	8,000	0%	62	Max	322.58	n/a	n/a	n/a	n/a	322.58	34.75	357.33	$665	$237,625	**$11.88**
MECH	# 2	20,000	0	1	10,000	0%	20	Min	1000.00	n/a	n/a	n/a	n/a	1000.00	34.75	1034.75	$665	$688,109	**$34.41**
MECH		20,000	0	1	10,000	0%	36	Avg	555.56	n/a	n/a	n/a	n/a	555.56	34.75	590.31	$665	$392,553	**$19.63**
MECH		20,000	0	1	10,000	0%	62	Max	322.58	n/a	n/a	n/a	n/a	322.58	34.75	357.33	$665	$237,625	**$11.88**
MECH	# 3	20,000	0	1	12,000	0%	20	Min	1000.00	n/a	n/a	n/a	n/a	1000.00	34.75	1034.75	$665	$688,109	**$34.41**
MECH		20,000	0	1	12,000	0%	36	Avg	555.56	n/a	n/a	n/a	n/a	555.56	34.75	590.31	$665	$392,553	**$19.63**
MECH		20,000	0	1	12,000	0%	62	Max	322.58	n/a	n/a	n/a	n/a	322.58	34.75	357.33	$665	$237,625	**$11.88**
MECH	# 4	20,000	0	1	16,000	0%	20	Min	1000.00	n/a	n/a	n/a	n/a	1000.00	34.75	1034.75	$665	$688,109	**$34.41**
MECH		20,000	0	1	16,000	0%	36	Avg	555.56	n/a	n/a	n/a	n/a	555.56	34.75	590.31	$665	$392,553	**$19.63**
MECH		20,000	0	1	16,000	0%	62	Max	322.58	n/a	n/a	n/a	n/a	322.58	34.75	357.33	$665	$237,625	**$11.88**
		Hyd. Dredge Production Rates:					Min	51	CY/hr		Mech Dredge Production Rates:					Min	20	CY/hr	
							Avg	108	CY/hr							Avg	36	CY/hr	
							Max	192	CY/hr							Max	62	CY/hr	
		Rental Rate for Hyd. Dredge						698	$/hr		Rental Rate for Mech Dredge						665	$/hr	

QUANTITY: 100,000 CY

6/23/2008

DREDGE TYPE	CUT	VOLUME (CU YDS)	EVENT WITH BOOSTER(S)	EVENT WITH NO BOOSTER	TOTAL TRANSPORT (FEET)	REHANDLE (%)	PRODUCTION (CU YDS/HOUR)		DREDGING TIME (HOURS)	PASSING VESSEL TIME CROSSING PIPELINE	PASSING VESSEL TIME NON-CROSSING	PLACEMENT TIME	REHANDLE TIME	TOTAL DREDGING TIME	MOB./DEMOB. TIME	TOTAL TIME	RENTAL RATE PER HOUR	COST/ EVENT	COST / CU YD		
HYD.	# 1	100,000	0	1	8,000	0%	51	Min	1960.78	372.55	0.00	627.45	0.00	2960.78	43.60	3004.38	$698	$2,097,060	**$20.97**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		100,000	0	1	8,000	0%	108	Avg	925.93	175.93	0.00	296.30	0.00	1398.15	43.60	1441.75	$698	$1,006,340	**$10.06**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		100,000	0	1	8,000	0%	192	Max	520.83	98.96	0.00	166.67	0.00	786.46	43.60	830.06	$698	$579,381	**$5.79**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.	# 2	100,000	1	0	10,000	0%	51	Min	1960.78	372.55	0.00	627.45	0.00	2960.78	43.60	3004.38	$698	$2,097,060	**$20.97**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		100,000	1	0	10,000	0%	108	Avg	925.93	175.93	0.00	296.30	0.00	1398.15	43.60	1441.75	$698	$1,006,340	**$10.06**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		100,000	1	0	10,000	0%	192	Max	520.83	98.96	0.00	166.67	0.00	786.46	43.60	830.06	$698	$579,381	**$5.79**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.	# 3	100,000	2	0	12,000	0%	51	Min	1960.78	372.55	0.00	627.45	0.00	2960.78	43.60	3004.38	$698	$2,097,060	**$20.97**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		100,000	2	0	12,000	0%	108	Avg	925.93	175.93	0.00	296.30	0.00	1398.15	43.60	1441.75	$698	$1,006,340	**$10.06**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		100,000	2	0	12,000	0%	192	Max	520.83	98.96	0.00	166.67	0.00	786.46	43.60	830.06	$698	$579,381	**$5.79**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.	# 4	100,000	0	1	16,000	100%	51	Min	1960.78	372.55	0.00	627.45	2960.78	5921.57	44.20	5965.77	$698	$4,164,107	**$41.64**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		100,000	0	1	16,000	100%	108	Avg	925.93	175.93	0.00	296.30	1398.15	2796.30	44.20	2840.50	$698	$1,982,666	**$19.83**	100%	crossing line
										19%	10%	32%								0%	non-crossing line
HYD.		100,000	0	1	16,000	100%	192	Max	520.83	98.96	0.00	166.67	786.46	1572.92	44.20	1617.12	$698	$1,128,747	**$11.29**	100%	crossing line
										19%	10%	32%								0%	non-crossing line

DREDGE TYPE	CUT	VOLUME (CU YDS)	EVENT WITH BOOSTER(S)	EVENT WITH NO BOOSTER	TOTAL TRANSPORT (FEET)	REHANDLE (%)	PRODUCTION (CU YDS/HOUR)		DREDGING TIME (HOURS)	PASSING VESSEL TIME CROSSING PIPELINE	PASSING VESSEL TIME NON-CROSSING	PLACEMENT TIME	REHANDLE TIME	TOTAL DREDGING TIME	MOB./DEMOB. TIME	TOTAL TIME	RENTAL RATE PER HOUR	COST/ EVENT	COST / CU YD
MECH		100,000	0	1	8,000	0%	36	Avg	2777.78	n/a	n/a	n/a	n/a	2777.78	34.75	2812.53	$665	$1,870,331	**$18.70**
MECH		100,000	0	1	8,000	0%	62	Max	1612.90	n/a	n/a	n/a	n/a	1612.90	34.75	1647.65	$665	$1,095,689	**$10.96**
MECH	# 2	100,000	0	1	10,000	0%	20	Min	5000.00	n/a	n/a	n/a	n/a	5000.00	34.75	5034.75	$665	$3,348,109	**$33.48**
MECH		100,000	0	1	10,000	0%	36	Avg	2777.78	n/a	n/a	n/a	n/a	2777.78	34.75	2812.53	$665	$1,870,331	**$18.70**
MECH		100,000	0	1	10,000	0%	62	Max	1612.90	n/a	n/a	n/a	n/a	1612.90	34.75	1647.65	$665	$1,095,689	**$10.96**
MECH	# 3	100,000	0	1	12,000	0%	20	Min	5000.00	n/a	n/a	n/a	n/a	5000.00	34.75	5034.75	$665	$3,348,109	**$33.48**
MECH		100,000	0	1	12,000	0%	36	Avg	2777.78	n/a	n/a	n/a	n/a	2777.78	34.75	2812.53	$665	$1,870,331	**$18.70**
MECH		100,000	0	1	12,000	0%	62	Max	1612.90	n/a	n/a	n/a	n/a	1612.90	34.75	1647.65	$665	$1,095,689	**$10.96**
MECH	# 4	100,000	0	1	16,000	0%	20	Min	5000.00	n/a	n/a	n/a	n/a	5000.00	34.75	5034.75	$665	$3,348,109	**$33.48**
MECH		100,000	0	1	16,000	0%	36	Avg	2777.78	n/a	n/a	n/a	n/a	2777.78	34.75	2812.53	$665	$1,870,331	**$18.70**
MECH		100,000	0	1	16,000	0%	62	Max	1612.90	n/a	n/a	n/a	n/a	1612.90	34.75	1647.65	$665	$1,095,689	**$10.96**
		Hyd. Dredge Production Rates:					Min	51	CY/hr		Mech Dredge Production Rates:					Min	20	CY/hr	
							Avg	108	CY/hr							Avg	36	CY/hr	
							Max	192	CY/hr							Max	62	CY/hr	
		Rental Rate for Hyd. Dredge						698	$/hr		Rental Rate for Mech Dredge						665	$/hr	

8,000 ft & 1,000 CY			**8,000 ft & 5,000 CY**			**8,000 ft & 20,000 CY**			**8,000 ft & 100,000 CY**		
Prod. Rate	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*
Low	$56.36	$51.10	*Low*	COST / C	$26.75	*Low*	COST / C	$22.19	*Low*	COST / C	$20.97
Avg	$41.58	$40.19	*Avg*	$23.09	$15.85	*Avg*	$19.63	$11.28	*Avg*	$18.70	$10.06
High	$33.83	$35.92	*High*	$15.35	$11.58	*High*	$11.88	$7.01	*High*	$10.96	$5.79
10,000 ft & 1,000 CY			**10,000 ft & 5,000 CY**			**10,000 ft & 20,000 CY**			**10,000 ft & 100,000 CY**		
Prod. Rate	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*
Low	$56.36	$51.10	*Low*	$37.87	$26.75	*Low*	$34.41	$22.19	*Low*	$33.48	$20.97
Avg	$41.58	$40.19	*Avg*	$23.09	$15.85	*Avg*	$19.63	$11.28	*Avg*	$18.70	$10.06
High	$33.83	$35.92	*High*	$15.35	$11.58	*High*	$11.88	$7.01	*High*	$10.96	$5.79
12,000 ft & 1,000 CY			**12,000 ft & 5,000 CY**			**12,000 ft & 20,000 CY**			**12,000 ft & 100,000 CY**		
Prod. Rate	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*
Low	$56.36	$51.10	*Low*	$37.87	$26.75	*Low*	$34.41	$22.19	*Low*	$33.48	$20.97
Avg	$41.58	$40.19	*Avg*	$23.09	$15.85	*Avg*	$19.63	$11.28	*Avg*	$18.70	$10.06
High	$33.83	$35.92	*High*	$15.35	$11.58	*High*	$11.88	$7.01	High	$10.96	$5.79
16,000 ft & 1,000 CY			**16,000 ft & 5,000 CY**			**16,000 ft & 20,000 CY**			**16,000 ft & 100,000 CY**		
Prod. Rate	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*	*Prod. Rate*	*MBD*	*CPD*
Low	$56.36	$72.18	*Low*	$37.87	$47.50	*Low*	$34.41	$42.88	*Low*	$33.48	$41.64
Avg	$41.58	$50.37	*Avg*	$23.09	$25.69	*Avg*	$19.63	$21.06	*Avg*	$18.70	$19.83
High	$33.83	$41.83	*High*	$15.35	$17.15	*High*	$11.88	$12.52	*High*	$10.96	$11.29

APPENDIX D

LIMITED
LIFE CYCLE ASSESSMENT
OUTPUT TABLES

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:44:01 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartn	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_Higl	CPD_1k_1.5_Low	MBD_1k_1.5_Avg	MBD_1k_1.5_Hig	MBD_1k_1.5_Low
	Total		kg SO2	871.9988454	720.4598206	1259.289296	773.4984793	595.7648517	1112.945895
1	Nitric oxide	Air	kg SO2	862.1396092	712.3139572	1245.051169	764.7529354	589.0288492	1100.362396
2	Nitrogen oxides	Air	kg SO2	0.723885208	0.598085892	1.045392318	0.642115653	0.494571026	0.923906121
3	Sulfur oxides	Air	kg SO2	9.135350936	7.547777536	13.19273495	8.103428226	6.241431424	11.65959264

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:46:50 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartr	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.9_Avg	CPD_1k_1.9_Hig	CPD_1k_1.9_Lov	MBD_1k_1.9_Avg	MBD_1k_1.9_Hig	MBD_1k_1.9_Lov
	Total		kg SO2	959.2420268	769.3852772	1443.950422	781.5083992	603.7747715	1120.955815
1	Nitric oxide	Air	kg SO2	948.3963775	760.6862391	1427.624427	772.6722913	596.9482051	1108.281752
2	Nitrogen oxides	Air	kg SO2	0.796309672	0.6387011	1.19868777	0.648765045	0.501220418	0.930555513
3	Sulfur oxides	Air	kg SO2	10.04933962	8.060336948	15.12730654	8.18734282	6.325346018	11.74350724

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:50:07 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartn	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_2.3_Avg	CPD_1k_2.3_Higl	CPD_1k_2.3_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_Hig	MBD_1k_2.3_Low
	Total		kg SO2	1046.268724	818.5272181	1628.611548	789.518319	611.7846914	1128.965735
1	Nitric oxide	Air	kg SO2	1034.439109	809.2725577	1610.197686	780.5916472	604.867561	1116.201108
2	Nitrogen oxides	Air	kg SO2	0.868554422	0.679496021	1.351983223	0.655414437	0.507869811	0.937204906
3	Sulfur oxides	Air	kg SO2	10.96106035	8.575164322	17.06187813	8.271257414	6.409260612	11.82742183

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:53:00 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartr	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_3.0_Avg	CPD_1k_3.0_Hig	CPD_1k_3.0_Lov	MBD_1k_3.0_Avg	MBD_1k_3.0_Hig	MBD_1k_3.0_Lov
	Total		kg SO2	1225.95071	922.6561765	2000.748096	803.8062842	626.0726566	1143.2537
1	Nitric oxide	Air	kg SO2	1212.089525	912.2241843	1978.12668	794.7180658	618.9939796	1130.327526
2	Nitrogen oxides	Air	kg SO2	1.017716468	0.765938122	1.660910401	0.667275516	0.519730889	0.949065984
3	Sulfur oxides	Air	kg SO2	12.84346881	9.666054044	20.9605048	8.420942906	6.558946104	11.97710732

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:08:21 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartm	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	MBD_5k_1.5_Avg	MBD_5k_1.5_High	MBD_5k_1.5_Low
	Total		kg SO2	2258.364438	1500.236345	4195.033174	2591.317324	1701.999732	4287.904948
1	Nitric oxide	Air	kg SO2	2232.830289	1483.273955	4147.602122	2562.01865	1682.756109	4239.423843
2	Nitrogen oxides	Air	kg SO2	1.874769238	1.245413231	3.482484499	2.151168307	1.412906034	3.559581509
3	Sulfur oxides	Air	kg SO2	23.65937958	15.71697666	43.94856764	27.14750514	17.83071724	44.92152333

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:10:56 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.9_Avg	CPD_5k_1.9_High	CPD_5k_1.9_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low
	Total		kg SO2	2694.147376	1745.296597	5118.122319	2631.799892	1742.482301	4328.387516
1	Nitric oxide	Air	kg SO2	2663.686057	1725.563438	5060.25438	2602.043503	1722.780962	4279.448696
2	Nitrogen oxides	Air	kg SO2	2.236532129	1.448848696	4.248782049	2.184774696	1.446512423	3.593187898
3	Sulfur oxides	Air	kg SO2	28.22478709	18.28430964	53.6191576	27.57161403	18.25482614	45.34563223

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:13:35 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High	MBD_5k_2.3_Low
	Total		kg SO2	3129.930314	1990.573332	6040.99498	2672.28246	1782.964869	4368.870084
1	Nitric oxide	Air	kg SO2	3094.541825	1968.066958	5972.692601	2642.068356	1762.805815	4319.473549
2	Nitrogen oxides	Air	kg SO2	2.59829502	1.652463875	5.014899884	2.218381085	1.480118812	3.626794287
3	Sulfur oxides	Air	kg SO2	32.7901946	20.85391059	63.28747961	27.99572293	18.67893503	45.76974112

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:17:11 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low	MBD_5k_3.0_Avg	MBD_5k_3.0_High	MBD_5k_3.0_Low
	Total		kg SO2	3998.681895	2482.209226	7872.235852	2742.856348	1853.538757	4439.443973
1	Nitric oxide	Air	kg SO2	3953.470884	2454.144181	7783.228587	2711.844302	1832.581761	4389.249495
2	Nitrogen oxides	Air	kg SO2	3.319484528	2.0605928	6.535094764	2.276967624	1.538705351	3.685380825
3	Sulfur oxides	Air	kg SO2	41.8915261	26.00445229	82.47217017	28.73507854	19.41829064	46.50909673

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:56:47 PM			
Project	Thesis_Dredging Limited LCA							

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	MBD_20k_1.5_Avg	MBD_20k_1.5_High	MBD_20k_1.5_Low
	Total		kg SO2	7457.018925	4424.506555	15204.12684	9408.192111	5850.921746	16194.54261
1	Nitric oxide	Air	kg SO2	7372.706301	4374.480967	15032.22171	9301.818589	5784.768426	16011.43936
2	Nitrogen oxides	Air	kg SO2	6.190404638	3.672980607	12.62162511	7.810160691	4.857111599	13.4438135
3	Sulfur oxides	Air	kg SO2	78.12221905	46.35260736	159.2835072	98.56336056	61.29620897	169.6594333

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:59:37 PM			
Project	Thesis_Dredging Limited LCA							

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.9_Avg	CPD_20k_1.9_High	CPD_20k_1.9_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low
	Total		kg SO2	9200.583647	5405.180529	18896.05045	9570.122383	6012.852018	16356.47288
1	Nitric oxide	Air	kg SO2	9096.557446	5344.066972	18682.40266	9461.918	5944.867837	16171.53877
2	Nitrogen oxides	Air	kg SO2	7.637815627	4.487081896	15.68645588	7.944586246	4.991537154	13.57823905
3	Sulfur oxides	Air	kg SO2	96.388385	56.62647522	197.9613311	100.2597961	62.99264455	171.3558689

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:02:25 PM				
Project	Thesis_Dredging Limited LCA								

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	MBD_20k_2.3_Avg	MBD_20k_2.3_High	MBD_20k_2.3_Low
	Total		kg SO2	10943.93188	6385.854504	22588.19055	9731.836171	6174.565806	16518.18667
1	Nitric oxide	Air	kg SO2	10820.19455	6313.652977	22332.79766	9621.803375	6104.753211	16331.42415
2	Nitrogen oxides	Air	kg SO2	9.085046904	5.301183185	18.75146636	8.078832087	5.125782996	13.71248489
3	Sulfur oxides	Air	kg SO2	114.652283	66.90034308	236.641423	101.9539637	64.68681216	173.0500365

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:05:13 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low	MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
	Total		kg SO2	14395.99087	8330.966129	29890.42318	10014.78118	6457.510814	16801.13168
1	Nitric oxide	Air	kg SO2	14233.22291	8236.77224	29552.46776	9901.549271	6384.499107	16611.17004
2	Nitrogen oxides	Air	kg SO2	11.95075533	6.915907266	24.81337598	8.313717382	5.360668291	13.94737019
3	Sulfur oxides	Air	kg SO2	150.817205	87.27798165	313.1420493	104.9181901	67.6510385	176.0142629

SimaPro 7.1 Inventory Date: 8/13/2008 Time: 2:27:21 PM
Project Thesis_Dredging Limited LCA

Title: Comparing product stages
Method: Eco-indicator 95 V2.03 / Europe e
Per sub-compartment: No
Skip unused: Yes
Indicator: Characterization
Category: acidification
Cut-off: 0%
Relative mode: Non

No	Substance	Compartment	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low
	Total		kg SO2	35183.68132	20020.6865	73919.43738	45765.65142	27979.2996	79696.97094
1	Nitric oxide	Air	kg SO2	34785.87778	19794.32304	73083.66885	45248.20307	27662.95225	78795.87885
2	Nitrogen oxides	Air	kg SO2	29.2075461	16.62006652	61.36382817	37.99211235	23.22686689	66.16001696
3	Sulfur oxides	Air	kg SO2	368.5959881	209.7433937	774.4046967	479.4562386	293.1204807	834.9320666

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:31:04 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.9_Avg	CPD_100k_1.9_High	CPD_100k_1.9_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low
	Total		kg SO2	43900.85548	24924.05637	92379.05544	46574.43684	28788.08502	80505.75636
1	Nitric oxide	Air	kg SO2	43404.4914	24642.25307	91334.57364	46047.84397	28462.59316	79595.51976
2	Nitrogen oxides	Air	kg SO2	36.44406191	20.69057296	76.68798202	38.66352127	23.89827581	66.83142588
3	Sulfur oxides	Air	kg SO2	459.920014	261.112733	967.7938165	487.9293447	301.5935868	843.4051726

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:36:15 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	MBD_100k_2.3_Avg	MBD_100k_2.3_High	MBD_100k_2.3_Low
	Total		kg SO2	52617.81315	29827.42625	110838.89	47383.22226	29596.87044	81314.54178
1	Nitric oxide	Air	kg SO2	52022.89098	29490.18309	109585.6925	46847.48488	29262.23407	80395.16067
2	Nitrogen oxides	Air	kg SO2	43.680398	24.76107941	92.01231558	39.33493019	24.56968474	67.5028348
3	Sulfur oxides	Air	kg SO2	551.2417719	312.4820723	1161.185204	496.4024507	310.0666928	851.8782787

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:40:25 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_3.0_Avg	CPD_100k_3.0_High	CPD_100k_3.0_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
	Total		kg SO2	69849.31565	39523.32602	147320.6113	48798.59676	31012.24493	82729.91628
1	Nitric oxide	Air	kg SO2	69059.56587	39076.45638	145654.934	48246.85647	30661.60566	81794.53226
2	Nitrogen oxides	Air	kg SO2	57.98503825	32.81007909	122.2974227	40.50989581	25.74465035	68.67780042
3	Sulfur oxides	Air	kg SO2	731.7647432	414.0595544	1543.379892	511.2303863	324.8946283	866.7062142

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:44:25 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	MBD_1k_1.5_Avg	MBD_1k_1.5_High	MBD_1k_1.5_Low
	Total		kg B(a)P	0.020410267	0.016863299	0.029475303	0.018104738	0.013944651	0.026049946
1	Benzene	Air	kg B(a)P	1.03705E-05	8.56824E-06	1.49764E-05	9.19901E-06	7.08527E-06	1.3236E-05
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.020399896	0.016854731	0.029460327	0.018095539	0.013937566	0.02603671

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:47:14 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.9_Avg	CPD_1k_1.9_High	CPD_1k_1.9_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low
	Total		kg B(a)P	0.022452307	0.018008463	0.033797537	0.01829222	0.014132134	0.026237428
1	Benzene	Air	kg B(a)P	1.1408E-05	9.15009E-06	1.71725E-05	9.29427E-06	7.18053E-06	1.33312E-05
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.022440899	0.017999313	0.033780365	0.018282926	0.014124953	0.026224097

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:50:33 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High	MBD_1k_2.3_Low
	Total		kg B(a)P	0.02448928	0.019158694	0.038119771	0.018479703	0.014319616	0.026424911
1	Benzene	Air	kg B(a)P	1.2443E-05	9.73453E-06	1.93686E-05	9.38953E-06	7.27579E-06	1.34265E-05
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.024476837	0.019148959	0.038100402	0.018470313	0.01431234	0.026411485

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:53:27 PM				
Project	Thesis_Dredging Limited LCA								

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low	MBD_1k_3.0_Avg	MBD_1k_3.0_High	MBD_1k_3.0_Low
	Total		kg B(a)P	0.02869497	0.021595968	0.046830111	0.018814131	0.014654045	0.026759339
1	Benzene	Air	kg B(a)P	1.45799E-05	1.09729E-05	2.37944E-05	9.55945E-06	7.44572E-06	1.35964E-05
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.028680391	0.021584995	0.046806316	0.018804572	0.014646599	0.026745743

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:08:50 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	MBD_5k_1.5_Avg	MBD_5k_1.5_High	MBD_5k_1.5_Low
	Total		kg B(a)P	0.052859956	0.035114982	0.098190206	0.060653151	0.039837517	0.100363991
1	Benzene	Air	kg B(a)P	2.68581E-05	1.78419E-05	4.98904E-05	3.08178E-05	2.02414E-05	5.09949E-05
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.052833098	0.035097141	0.098140316	0.060622334	0.039817275	0.100312996

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:11:23 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.9_Avg	CPD_5k_1.9_High	CPD_5k_1.9_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low
	Total		kg B(a)P	0.063060023	0.040850936	0.119796308	0.061600699	0.040785064	0.101311538
1	Benzene	Air	kg B(a)P	3.20408E-05	2.07563E-05	6.08685E-05	3.12993E-05	2.07229E-05	5.14764E-05
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.063027982	0.04083018	0.11973544	0.061569399	0.040764341	0.101260062

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:14:13 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High	MBD_5k_2.3_Low
	Total		kg B(a)P	0.073260089	0.046591957	0.141397343	0.062548246	0.041732611	0.102259085
1	Benzene	Air	kg B(a)P	3.72234E-05	2.36734E-05	7.18439E-05	3.17807E-05	2.12043E-05	5.19578E-05
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.073222865	0.046568284	0.141325499	0.062516465	0.041711407	0.102207127

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:17:48 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low	MBD_5k_3.0_Avg	MBD_5k_3.0_High	MBD_5k_3.0_Low
	Total		kg B(a)P	0.093594349	0.058099335	0.184259916	0.064200119	0.043384485	0.103910959
1	Benzene	Air	kg B(a)P	4.75553E-05	2.95203E-05	9.36224E-05	3.26201E-05	2.20436E-05	5.27971E-05
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.093546794	0.058069814	0.184166294	0.064167499	0.043362441	0.103858162

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:57:14 PM				
Project	Thesis_Dredging Limited LCA								
Title:	Comparing product stages								
Method:	Eco-indicator 95 V2.03 / Europe e								
Per sub-compartment:	No								
Skip unused:	Yes								
Indicator:	Characterization								
Category:	carcinogens								
Cut-off:	0%								
Relative mode:	Non								
No	Substance	Compartment	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	MBD_20k_1.5_Avg	MBD_20k_1.5_High	MBD_20k_1.5_Low
	Total		kg B(a)P	0.174541224	0.103561329	0.355872359	0.22021097	0.136948431	0.379054328
1	Benzene	Air	kg B(a)P	8.86843E-05	5.26195E-05	0.000180819	0.000111889	6.95835E-05	0.000192597
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.17445254	0.10350871	0.35569154	0.220099081	0.136878848	0.37886173

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:00:04 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.9_Avg	CPD_20k_1.9_High	CPD_20k_1.9_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low
	Total		kg B(a)P	0.215351624	0.126515279	0.442286631	0.224001158	0.14073862	0.382844516
1	Benzene	Air	kg B(a)P	0.00010942	6.42824E-05	0.000224726	0.000113815	7.15093E-05	0.000194523
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.215242204	0.126450996	0.442061906	0.223887343	0.140667111	0.382649993

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:02:52 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	MBD_20k_2.3_Avg	MBD_20k_2.3_High	MBD_20k_2.3_Low
	Total		kg B(a)P	0.256156956	0.149469228	0.528705971	0.22778628	0.144523741	0.386629638
1	Benzene	Air	kg B(a)P	0.000130153	7.59453E-05	0.000268635	0.000115738	7.34325E-05	0.000196446
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.256026803	0.149393283	0.528437336	0.227670542	0.144450309	0.386433191

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:05:42 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low	MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
	Total		kg B(a)P	0.336956885	0.194997095	0.699624221	0.234408976	0.151146437	0.393252333
1	Benzene	Air	kg B(a)P	0.000171208	9.9078E-05	0.000355479	0.000119103	7.67975E-05	0.000199811
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.336785678	0.194898017	0.699268742	0.234289873	0.15106964	0.393052522

SimaPro 7.1	Inventory	Date:	8/13/2008	Time: 2:27:48 PM
Project	Thesis_Dredging Limited LCA			

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low
	Total		kg B(a)P	0.823519811	0.4686102	1.730180549	1.07120458	0.654891889	1.865411235
1	Benzene	Air	kg B(a)P	0.00041843	0.000238101	0.000879104	0.000544279	0.00033275	0.000947815
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.82310138	0.4683721	1.729301445	1.070660302	0.654559138	1.86446342

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:31:27 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.9_Avg	CPD_100k_1.9_High	CPD_100k_1.9_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low
	Total		kg B(a)P	1.027556607	0.583379948	2.162251913	1.090135255	0.673822563	1.884341909
1	Benzene	Air	kg B(a)P	0.000522101	0.000296415	0.00109864	0.000553897	0.000342369	0.000957434
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	1.027034505	0.583083533	2.161153273	1.089581358	0.673480194	1.883384476

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:36:34 PM					
Project	Thesis_Dredging Limited LCA									
Title:	Comparing product stages									
Method:	Eco-indicator 95 V2.03 /	Europe e								
Per sub-compartment:	No									
Skip unused:	Yes									
Indicator:	Characterization									
Category:	carcinogens									
Cut-off:	0%									
Relative mode:	Non									
No	Substance	Compartment	Unit	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	MBD_100k_2.3_Avg	MBD_100k_2.3_High	MBD_100k_2.3_Low	
	Total		kg B(a)P	1.231588336	0.698149696	2.594328344	1.109065929	0.692753238	1.903272584	
1	Benzene	Air	kg B(a)P	0.00062577	0.00035473	0.001318177	0.000563516	0.000351988	0.000967052	
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	1.230962566	0.697794966	2.593010166	1.108502413	0.69240125	1.902305532	

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:40:53 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_3.0_Avg	CPD_100k_3.0_High	CPD_100k_3.0_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
	Total		kg B(a)P	1.634914058	0.925094838	3.448230468	1.14219461	0.725881918	1.936401264
1	Benzene	Air	kg B(a)P	0.000830699	0.00047004	0.001752045	0.000580349	0.00036882	0.000983885
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	1.634083359	0.924624797	3.446478423	1.141614261	0.725513098	1.935417379

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:44:13 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	MBD_1k_1.5_Avg	MBD_1k_1.5_High	MBD_1k_1.5_Low
	Total		kg PO4	161.2820263	133.2538688	232.9139889	143.063724	110.1906992	205.8467968
1	Nitric oxide	Air	kg PO4	161.1475905	133.1427957	232.7198446	142.9444739	110.0988503	205.6752142
2	Nitrogen oxides	Air	kg PO4	0.134435824	0.111073094	0.194144288	0.11925005	0.091848905	0.171582565

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:47:02 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.9_Avg	CPD_1k_1.9_High	CPD_1k_1.9_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low
	Total		kg PO4	177.418237	142.3029597	267.0683008	144.5452123	111.6721875	207.3282851
1	Nitric oxide	Air	kg PO4	177.2703509	142.1843438	266.8456874	144.4247273	111.5791038	207.1554676
2	Nitrogen oxides	Air	kg PO4	0.147886082	0.118615919	0.222613443	0.120484937	0.093083792	0.172817452

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:50:21 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High	MBD_1k_2.3_Low
	Total		kg PO4	193.5144075	151.3920908	301.2226127	146.0267006	113.1536759	208.8097734
1	Nitric oxide	Air	kg PO4	193.3531045	151.2658986	300.9715301	145.9049808	113.0593572	208.6357211
2	Nitrogen oxides	Air	kg PO4	0.161302964	0.126192118	0.251082599	0.121719824	0.094318679	0.17405234

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:53:14 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low	MBD_1k_3.0_Avg	MBD_1k_3.0_High	MBD_1k_3.0_Low
	Total		kg PO4	226.7477942	170.651439	370.0517595	148.6693555	115.7963307	211.4524283
1	Nitric oxide	Air	kg PO4	226.5587897	170.5091933	369.7433047	148.5454329	115.6998093	211.2761732
2	Nitrogen oxides	Air	kg PO4	0.189004487	0.142245651	0.308454789	0.123922596	0.096521451	0.176255111

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:08:34 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	MBD_5k_1.5_Avg	MBD_5k_1.5_High	MBD_5k_1.5_Low
	Total		kg PO4	417.6996273	277.4787593	775.8994802	479.2814934	314.796249	793.0767367
1	Nitric oxide	Air	kg PO4	417.3514559	277.2474683	775.2527331	478.8819907	314.5338522	792.4156716
2	Nitrogen oxides	Air	kg PO4	0.34817143	0.231291029	0.646747121	0.399502686	0.262396835	0.661065137

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:11:10 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.9_Avg	CPD_5k_1.9_High	CPD_5k_1.9_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low
	Total		kg PO4	498.3006002	322.804294	946.6309997	486.7690154	322.2837711	800.5642588
1	Nitric oxide	Air	kg PO4	497.8852443	322.5352221	945.8419401	486.3632716	322.0151331	799.8969525
2	Nitrogen oxides	Air	kg PO4	0.415355967	0.269071901	0.789059523	0.405743872	0.268638021	0.667306324

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:14:00 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High	MBD_5k_2.3_Low
	Total		kg PO4	578.9015732	368.169869	1117.322479	494.2565375	329.7712932	808.0517809
1	Nitric oxide	Air	kg PO4	578.4190327	367.8629828	1116.39114	493.8445525	329.496414	807.3782334
2	Nitrogen oxides	Air	kg PO4	0.482540504	0.306886148	0.93133855	0.411985059	0.274879208	0.67354751

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:17:27 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low	MBD_5k_3.0_Avg	MBD_5k_3.0_High	MBD_5k_3.0_Low
	Total		kg PO4	739.5829961	459.10122	1456.022742	507.3096509	342.8244065	821.1048943
1	Nitric oxide	Air	kg PO4	738.9665204	458.7185384	1454.809082	506.8867854	342.538647	820.4204664
2	Nitrogen oxides	Air	kg PO4	0.616475698	0.38268152	1.213660456	0.422865416	0.285759565	0.684427868

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:57:02 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	MBD_20k_1.5_Avg	MBD_20k_1.5_High	MBD_20k_1.5_Low
	Total		kg PO4	1379.225591	818.3421187	2812.105083	1740.108139	1082.167161	2995.289112
1	Nitric oxide	Air	kg PO4	1378.075944	817.6599938	2809.761067	1738.65768	1081.265126	2992.792404
2	Nitrogen oxides	Air	kg PO4	1.149646576	0.68212497	2.344016092	1.450458414	0.902035011	2.496708221

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:59:51 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.9_Avg	CPD_20k_1.9_High	CPD_20k_1.9_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low
	Total		kg PO4	1701.709563	999.724338	3494.95108	1770.058227	1112.11725	3025.239201
1	Nitric oxide	Air	kg PO4	1700.291111	998.8910228	3492.037881	1768.582804	1111.19025	3022.717528
2	Nitrogen oxides	Air	kg PO4	1.418451474	0.833315209	2.913198949	1.47542316	0.926999757	2.521672967

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:02:38 PM			
Project	Thesis_Dredging Limited LCA							

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	MBD_20k_2.3_Avg	MBD_20k_2.3_High	MBD_20k_2.3_Low
	Total		kg PO4	2024.153495	1181.106557	4177.837118	1799.968275	1142.027298	3055.149249
1	Nitric oxide	Air	kg PO4	2022.466272	1180.122052	4174.354702	1798.467921	1141.075367	3052.602644
2	Nitrogen oxides	Air	kg PO4	1.687222996	0.984505449	3.482415181	1.500354531	0.951931128	2.546604337

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:05:26 PM				
Project	Thesis_Dredging Limited LCA								

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low	MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
	Total		kg PO4	2662.634923	1540.867979	5528.433947	1852.300849	1194.359872	3107.481823
1	Nitric oxide	Air	kg PO4	2660.415497	1539.583596	5523.825749	1850.756873	1193.364319	3104.891597
2	Nitrogen oxides	Air	kg PO4	2.219425989	1.284382778	4.608198397	1.543976085	0.995552683	2.590225892

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:27:33 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low
	Total		kg PO4	6507.457489	3702.960049	13671.89499	8464.663728	5174.958841	14740.48852
1	Nitric oxide	Air	kg PO4	6502.033231	3699.873465	13660.49885	8457.60805	5170.64528	14728.20165
2	Nitrogen oxides	Air	kg PO4	5.424258561	3.086583782	11.39613952	7.055678008	4.313560994	12.28686029

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:31:14 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.9_Avg	CPD_100k_1.9_High	CPD_100k_1.9_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low
	Total		kg PO4	8119.75723	4609.871145	17086.12498	8614.254008	5324.549122	14890.0788
1	Nitric oxide	Air	kg PO4	8112.989047	4606.028611	17071.88292	8607.07364	5320.11087	14877.66725
2	Nitrogen oxides	Air	kg PO4	6.768182926	3.842534979	14.2420538	7.180368236	4.438251223	12.41155052

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:36:25 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	MBD_100k_2.3_Avg	MBD_100k_2.3_High	MBD_100k_2.3_Low
	Total		kg PO4	9732.01693	5516.782242	20500.395	8763.844289	5474.139402	15039.66908
1	Nitric oxide	Air	kg PO4	9723.904856	5512.183756	20483.307	8756.539231	5469.576461	15027.13284
2	Nitrogen oxides	Air	kg PO4	8.112073915	4.598486176	17.08800146	7.305058465	4.562941451	12.53624075

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:40:38 PM			
Project	Thesis_Dredging Limited LCA							

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_3.0_Avg	CPD_100k_3.0_High	CPD_100k_3.0_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
	Total		kg PO4	12919.09872	7310.10384	27247.93368	9025.62728	5735.922393	15301.45207
1	Nitric oxide	Air	kg PO4	12908.33007	7304.010539	27225.2213	9018.104014	5731.141244	15288.69762
2	Nitrogen oxides	Air	kg PO4	10.76864996	6.093300402	22.7123785	7.523266364	4.781149351	12.75444865

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:43:48 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	MBD_1k_1.5_Avg	MBD_1k_1.5_High	MBD_1k_1.5_Low
	Total		kg CO2	41131.58872	33983.59664	59399.81419	36485.39386	28101.8203	52496.89613
1	Carbon dioxide, fossil	Air	kg CO2	41109.07921	33964.99891	59367.30729	36465.42702	28086.44141	52468.16689
2	Methane	Air	kg CO2	22.50950471	18.59772385	32.50689893	19.96684715	15.37888703	28.72923627

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:46:34 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.9_Avg	CPD_1k_1.9_High	CPD_1k_1.9_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low
	Total		kg CO2	45246.78987	36291.37694	68110.15311	36863.2163	28479.64273	52874.71856
1	Carbon dioxide, fossil	Air	kg CO2	45222.0283	36271.51627	68072.87943	36843.04269	28464.05708	52845.78256
2	Methane	Air	kg CO2	24.76157283	19.86067024	37.27368331	20.17361271	15.58565259	28.93600183

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:49:54 PM		
Project	Thesis_Dredging Limited LCA						

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High	MBD_1k_2.3_Low
	Total		kg CO2	49351.77961	38609.36865	76820.49203	37241.03874	28857.46517	53252.541
1	Carbon dioxide, fossil	Air	kg CO2	49324.77156	38588.23945	76778.45157	37220.65836	28841.67275	53223.39824
2	Methane	Air	kg CO2	27.00805269	21.12920489	42.0404677	20.38037827	15.79241815	29.14276739

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:52:46 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low	MBD_1k_3.0_Avg	MBD_1k_3.0_High	MBD_1k_3.0_Low
	Total		kg CO2	57827.25593	43521.06036	94373.9183	37914.99228	29531.41871	53926.49454
1	Carbon dioxide, fossil	Air	kg CO2	57795.60963	43497.2432	94322.27162	37894.24308	29515.25747	53896.98295
2	Methane	Air	kg CO2	31.64630714	23.81715716	51.64668384	20.74920332	16.1612432	29.51159244

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:08:10 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	MBD_5k_1.5_Avg	MBD_5k_1.5_High	MBD_5k_1.5_Low
	Total		kg CO2	106525.5048	70765.1216	197876.8436	122230.6646	80282.16249	202257.5416
1	Carbon dioxide, fossil	Air	kg CO2	106467.2081	70726.39497	197768.5544	122163.7731	80238.2276	202146.855
2	Methane	Air	kg CO2	58.29671129	38.72663049	108.2892707	66.89145266	43.93488729	110.6866335

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:10:44 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.9_Avg	CPD_5k_1.9_High	CPD_5k_1.9_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low
	Total		kg CO2	127081.0878	82324.44594	241418.3268	124140.1996	82191.69751	204167.0767
1	Carbon dioxide, fossil	Air	kg CO2	127011.5419	82279.3934	241286.2092	124072.2632	82146.71762	204055.345
2	Methane	Air	kg CO2	69.54587539	45.05253896	132.1176043	67.93645698	44.9798916	111.7316378

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:13:21 PM				
Project	Thesis_Dredging Limited LCA								
Title:	Comparing product stages								
Method:	Eco-indicator 95 V2.03 / Europe e								
Per sub-compartment:	No								
Skip unused:	Yes								
Indicator:	Characterization								
Category:	greenhouse								
Cut-off:	0%								
Relative mode:	Non								

No	Substance	Compartment	Unit	CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High	MBD_5k_2.3_Low
	Total		kg CO2	147636.6707	93893.98169	284949.5986	126049.7346	84101.23254	206076.6117
1	Carbon dioxide, fossil	Air	kg CO2	147555.8757	93842.59766	284793.6582	125980.7532	84055.20764	205963.835
2	Methane	Air	kg CO2	80.79503948	51.38403569	155.9403498	68.98146129	46.02489592	112.7766421

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:16:47 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low	MBD_5k_3.0_Avg	MBD_5k_3.0_High	MBD_5k_3.0_Low
	Total		kg CO2	188615.0882	117084.1103	371327.9772	129378.6567	87430.15457	209405.5337
1	Carbon dioxide, fossil	Air	kg CO2	188511.8675	117020.0353	371124.7658	129307.8534	87382.3079	209290.9353
2	Methane	Air	kg CO2	103.2207203	64.07497045	203.2114273	70.80323352	47.84666815	114.5984144

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:56:34 PM				
Project	Thesis_Dredging Limited LCA								

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	MBD_20k_1.5_Avg	MBD_20k_1.5_High	MBD_20k_1.5_Low
	Total		kg CO2	351742.4789	208700.9459	717168.2569	443777.9826	275983.9742	763885.4908
1	Carbon dioxide, fossil	Air	kg CO2	351549.9857	208586.7331	716775.7823	443535.1225	275832.9404	763467.45
2	Methane	Air	kg CO2	192.4931477	114.2128245	392.4745617	242.8601204	151.0338589	418.0408437

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:59:25 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.9_Avg	CPD_20k_1.9_High	CPD_20k_1.9_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low
	Total		kg CO2	433985.2335	254958.6661	891313.7668	451416.1227	283622.1144	771523.631
1	Carbon dioxide, fossil	Air	kg CO2	433747.7325	254819.1385	890825.9901	451169.0826	283466.9005	771101.4101
2	Methane	Air	kg CO2	237.5009806	139.5276349	487.7767199	247.0401377	155.2138762	422.220861

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:02:09 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	MBD_20k_2.3_Avg	MBD_20k_2.3_High	MBD_20k_2.3_Low
	Total		kg CO2	516217.7767	301216.3863	1065469.488	459044.0514	291250.043	779151.5596
1	Carbon dioxide, fossil	Air	kg CO2	515935.2734	301051.5438	1064886.404	458792.8369	291090.6547	778725.1644
2	Methane	Air	kg CO2	282.5032253	164.8424453	583.0844664	251.2145667	159.3883052	426.39529

SimaPro 7.1	Inventory	Date:	8/13/2008	Time: 3:04:58 PM
Project	Thesis_Dredging Limited LCA			

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low	MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
	Total		kg CO2	679049.0363	392965.9704	1409910.804	472390.3738	304596.3654	792497.882
1	Carbon dioxide, fossil	Air	kg CO2	678677.4227	392750.9174	1409139.222	472131.8554	304429.6732	792064.1829
2	Methane	Air	kg CO2	371.6135932	215.0529468	771.5820094	258.5184204	166.6921589	433.6991437

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:27:06 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low
	Total		kg CO2	1659590.167	944362.0795	3486729.269	2158734.454	1319764.412	3759251.572
1	Carbon dioxide, fossil	Air	kg CO2	1658681.947	943845.2717	3484821.135	2157553.074	1319042.163	3757194.3
2	Methane	Air	kg CO2	908.2205147	516.8077221	1908.133173	1181.380172	722.2488645	2057.272612

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:30:54 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.9_Avg	CPD_100k_1.9_High	CPD_100k_1.9_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low
	Total		kg CO2	2070773.306	1175650.68	4357456.818	2196884.309	1357914.267	3797401.427
1	Carbon dioxide, fossil	Air	kg CO2	2069640.063	1175007.299	4355072.174	2195682.051	1357171.14	3795323.277
2	Methane	Air	kg CO2	1133.242914	643.3817742	2384.643964	1202.257905	743.1265978	2078.150345

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:36:05 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	MBD_100k_2.3_Avg	MBD_100k_2.3_High	MBD_100k_2.3_Low
	Total		kg CO2	2481946.233	1406939.281	5228194.579	2235034.164	1396064.122	3835551.282
1	Carbon dioxide, fossil	Air	kg CO2	2480587.973	1406169.325	5225333.419	2233811.028	1395300.118	3833452.254
2	Methane	Air	kg CO2	1358.259726	769.9558262	2861.160343	1223.135639	764.004331	2099.028079

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:40:13 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_3.0_Avg	CPD_100k_3.0_High	CPD_100k_3.0_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
	Total		kg CO2	3294744.413	1864288.237	6949012.404	2301796.41	1462826.368	3902313.528
1	Carbon dioxide, fossil	Air	kg CO2	3292941.344	1863267.995	6945209.516	2300536.738	1462025.828	3900177.964
2	Methane	Air	kg CO2	1803.068327	1020.242742	3802.888055	1259.671672	800.5403642	2135.564112

SimaPro 7.1	Inventory	Date:	8/13/2008	Time: 2:44:50 PM
Project	Thesis_Dredging Limited LCA			

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	MBD_1k_1.5_Avg	MBD_1k_1.5_High	MBD_1k_1.5_Low
	Total		kg C2H4	9.252386942	7.644474614	13.36175145	8.207243929	6.321392469	11.80896754
1	Acetaldehyde	Air	kg C2H4	0.102063795	0.08432679	0.147394512	0.090534742	0.069731768	0.130265633
2	Acrolein	Air	kg C2H4	0.014102059	0.011651353	0.020365361	0.0125091	0.009634773	0.01799868
3	Benzene	Air	kg C2H4	0.044545798	0.036804473	0.064330414	0.039513937	0.030434468	0.056854506
4	Formaldehyde	Air	kg C2H4	0.126148234	0.10422575	0.182175838	0.11189862	0.086186678	0.161004983
5	Methane	Air	kg C2H4	0.01432423	0.011834915	0.020686208	0.012706175	0.009786564	0.018282241
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.002099589	0.001734715	0.003032102	0.001862421	0.001434476	0.002679738
7	Propene	Air	kg C2H4	0.673713861	0.556633498	0.972937817	0.597611625	0.460293085	0.859871638
8	Toluene	Air	kg C2H4	0.058323917	0.048188182	0.084227961	0.051735689	0.03984792	0.074439736
9	VOC, volatile organic compounds	Air	kg C2H4	8.21706546	6.789074938	11.86660124	7.288871621	5.614042737	10.48757039

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:47:45 PM				
Project	Thesis_Dredging Limited LCA								
Title:	Comparing product stages								
Method:	Eco-indicator 95 V2.03 / Europe e								
Per sub-compartment:	No								
Skip unused:	Yes								
Indicator:	Characterization								
Category:	summer smog								
Cut-off:	0%								
Relative mode:	Non								

No	Substance	Compartment	Unit	CPD_1k_1.9_Avg	CPD_1k_1.9_High	CPD_1k_1.9_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low
	Total		kg C2H4	10.17808504	8.163600594	15.32110747	8.292233581	6.406382121	11.8939572
1	Acetaldehyde	Air	kg C2H4	0.112275242	0.090053309	0.16900832	0.091472269	0.070669296	0.13120316
2	Acrolein	Air	kg C2H4	0.015512965	0.012442581	0.023351721	0.012638637	0.00976431	0.018128217
3	Benzene	Air	kg C2H4	0.04900259	0.039303815	0.073763772	0.039923121	0.030843652	0.05726369
4	Formaldehyde	Air	kg C2H4	0.138769321	0.111303581	0.208889951	0.11305738	0.087345438	0.162163743
5	Methane	Air	kg C2H4	0.015757365	0.012638608	0.023719617	0.012837754	0.009918143	0.018413819
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.002309652	0.001852517	0.003476727	0.001881707	0.001453762	0.002699024
7	Propene	Air	kg C2H4	0.741118698	0.594433729	1.115608603	0.603800158	0.466481618	0.866060172
8	Toluene	Air	kg C2H4	0.064159205	0.051460576	0.096579078	0.052271435	0.040383666	0.074975482
9	VOC, volatile organic compounds	Air	kg C2H4	9.039180003	7.250111878	13.60670969	7.36435112	5.689522236	10.56304989

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:51:03 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High	MBD_1k_2.3_Low
	Total		kg C2H4	11.10148612	8.685023592	17.2804635	8.377223232	6.491371772	11.97894685
1	Acetaldehyde	Air	kg C2H4	0.122461351	0.095805166	0.190622127	0.092409796	0.071606823	0.132140688
2	Acrolein	Air	kg C2H4	0.01692037	0.01323731	0.02633808	0.012768175	0.009893847	0.018257755
3	Benzene	Air	kg C2H4	0.053448322	0.041814216	0.08319713	0.040332305	0.031252837	0.057672874
4	Formaldehyde	Air	kg C2H4	0.15135909	0.118412729	0.235604063	0.114216139	0.088504198	0.163322503
5	Methane	Air	kg C2H4	0.017186943	0.013445858	0.026753025	0.012969332	0.010049721	0.018545397
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.002519194	0.00197084	0.003921352	0.001900993	0.001473048	0.002718311
7	Propene	Air	kg C2H4	0.808356278	0.632401218	1.258279388	0.609988692	0.472670152	0.872248705
8	Toluene	Air	kg C2H4	0.069980013	0.054747451	0.108930196	0.052807181	0.040919412	0.075511228
9	VOC, volatile organic compounds	Air	kg C2H4	9.85925456	7.713188804	15.34681814	7.439830619	5.765001735	10.63852939

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:53:52 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low	MBD_1k_3.0_Avg	MBD_1k_3.0_High	MBD_1k_3.0_Low
	Total		kg C2H4	13.00801074	9.789889064	21.22903677	8.528826395	6.642974935	12.13055001
1	Acetaldehyde	Air	kg C2H4	0.143492371	0.107993022	0.234179144	0.094082143	0.073279169	0.133813034
2	Acrolein	Air	kg C2H4	0.019826206	0.014921294	0.032356312	0.012999241	0.010124914	0.018488821
3	Benzene	Air	kg C2H4	0.062627323	0.047133613	0.102207614	0.041062202	0.031982733	0.058402771
4	Formaldehyde	Air	kg C2H4	0.177352892	0.133476607	0.289439419	0.116283116	0.090571175	0.16538948
5	Methane	Air	kg C2H4	0.020138559	0.015156373	0.032866072	0.013204038	0.010284427	0.018780104
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.00295183	0.002221561	0.004817378	0.001935395	0.00150745	0.002752713
7	Propene	Air	kg C2H4	0.947180138	0.712852154	1.545795308	0.621027697	0.483709157	0.883287711
8	Toluene	Air	kg C2H4	0.081998099	0.061712149	0.133820666	0.053762836	0.041875067	0.076466884
9	VOC, volatile organic compounds	Air	kg C2H4	11.55244332	8.694422292	18.85355486	7.574469725	5.899640842	10.77316849

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:09:14 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	MBD_5k_1.5_Avg	MBD_5k_1.5_High	MBD_5k_1.5_Low
	Total		kg C2H4	23.96248773	15.91833205	44.51160729	27.49530082	18.05915247	45.49702785
1	Acetaldehyde	Air	kg C2H4	0.264332052	0.17559635	0.491010977	0.303302786	0.199211905	0.501881227
2	Acrolein	Air	kg C2H4	0.036522511	0.024261983	0.067842525	0.041907061	0.027524922	0.069344457
3	Benzene	Air	kg C2H4	0.115367867	0.076639122	0.214302006	0.132376665	0.086946143	0.219046332
4	Formaldehyde	Air	kg C2H4	0.326707641	0.217032587	0.606876981	0.374874469	0.246220808	0.620312331
5	Methane	Air	kg C2H4	0.037097907	0.024644219	0.068911354	0.042567288	0.027958565	0.070436949
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.005437664	0.003612252	0.010100752	0.006239344	0.004098055	0.010324368
7	Propene	Air	kg C2H4	1.744831926	1.159095595	3.241118966	2.002074209	1.314979735	3.312872503
8	Toluene	Air	kg C2H4	0.151051416	0.10034378	0.280586114	0.173321075	0.113838788	0.286797872
9	VOC, volatile organic compounds	Air	kg C2H4	21.28113875	14.13710617	39.53085762	24.41863792	16.03837355	40.40601181

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:11:45 PM		
Project	Thesis_Dredging Limited LCA						

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.9_Avg	CPD_5k_1.9_High	CPD_5k_1.9_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low
	Total		kg C2H4	28.58638419	18.51855599	54.30609039	27.92484311	18.48869476	45.92657014
1	Acetaldehyde	Air	kg C2H4	0.315338611	0.204279621	0.599054676	0.308041101	0.20395022	0.506619542
2	Acrolein	Air	kg C2H4	0.043570039	0.028225123	0.082770821	0.042561749	0.02817961	0.069999146
3	Benzene	Air	kg C2H4	0.137629707	0.089157951	0.261457736	0.134444704	0.089014183	0.221114372
4	Formaldehyde	Air	kg C2H4	0.38975044	0.252484375	0.740416224	0.380730904	0.252077243	0.626168766
5	Methane	Air	kg C2H4	0.044256466	0.028669798	0.084074839	0.043232291	0.028623567	0.071101951
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.006486937	0.004202305	0.012323355	0.006336817	0.004195529	0.010421841
7	Propene	Air	kg C2H4	2.081521598	1.348431268	3.954305635	2.033351392	1.346256918	3.344149686
8	Toluene	Air	kg C2H4	0.180198895	0.116734712	0.342327222	0.176028764	0.116546477	0.289505561
9	VOC, volatile organic compounds	Air	kg C2H4	25.38763149	16.44637084	48.22935988	24.80011539	16.41985101	40.78748928

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:14:43 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High	MBD_5k_2.3_Low
	Total		kg C2H4	33.21028064	21.12107695	64.09827647	28.35438541	18.91823706	46.35611243
1	Acetaldehyde	Air	kg C2H4	0.36634517	0.232988231	0.707073037	0.312779415	0.208688534	0.511357856
2	Acrolein	Air	kg C2H4	0.050617568	0.032191765	0.097695617	0.043216438	0.028834298	0.070653834
3	Benzene	Air	kg C2H4	0.159891547	0.101687839	0.308602408	0.136512744	0.091082223	0.223182412
4	Formaldehyde	Air	kg C2H4	0.452793239	0.287967481	0.873924148	0.386587339	0.257933678	0.632025201
5	Methane	Air	kg C2H4	0.051415025	0.032698932	0.099234768	0.043897294	0.02928857	0.071766954
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.00753621	0.004792879	0.014545437	0.006434291	0.004293002	0.010519315
7	Propene	Air	kg C2H4	2.418211271	1.537934198	4.667325046	2.064628574	1.377534101	3.375426868
8	Toluene	Air	kg C2H4	0.209346374	0.133140124	0.404053851	0.178736453	0.119254166	0.292213251
9	VOC, volatile organic compounds	Air	kg C2H4	29.49412424	18.7576755	56.92582216	25.18159286	16.80132848	41.16896674

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:18:25 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low	MBD_5k_3.0_Avg	MBD_5k_3.0_High	MBD_5k_3.0_Low
	Total		kg C2H4	42.42821232	26.33760394	83.52874845	29.10321315	19.6670648	47.10494018
1	Acetaldehyde	Air	kg C2H4	0.468028886	0.290532143	0.921412074	0.321039791	0.21694891	0.519618232
2	Acrolein	Air	kg C2H4	0.064667111	0.040142553	0.12731064	0.044357766	0.029975627	0.071795162
3	Benzene	Air	kg C2H4	0.20427146	0.12680291	0.402150796	0.14011799	0.094687469	0.226787657
4	Formaldehyde	Air	kg C2H4	0.578471706	0.359090281	1.138841703	0.396796953	0.268143292	0.642234815
5	Methane	Air	kg C2H4	0.065685913	0.040774981	0.129316363	0.045056603	0.03044788	0.072926264
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.00962798	0.005976634	0.018954678	0.006604218	0.004462929	0.010689242
7	Propene	Air	kg C2H4	3.089416267	1.917776348	6.082157606	2.119154572	1.432060098	3.429952866
8	Toluene	Air	kg C2H4	0.267453097	0.166023345	0.526536973	0.18345681	0.123974523	0.296933607
9	VOC, volatile organic compounds	Air	kg C2H4	37.6805899	23.39048475	74.18206762	25.84662845	17.46636407	41.83400233

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:57:40 PM		
Project	Thesis_Dredging Limited LCA						

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	MBD_20k_1.5_Avg	MBD_20k_1.5_High	MBD_20k_1.5_Low
	Total		kg C2H4	79.12306867	46.94644596	161.3241409	99.82608841	62.08149501	171.8329965
1	Acetaldehyde	Air	kg C2H4	0.87281268	0.51786987	1.779579056	1.101189289	0.684825765	1.895503053
2	Acrolein	Air	kg C2H4	0.120595707	0.071553593	0.245882764	0.152150288	0.094621732	0.261899874
3	Benzene	Air	kg C2H4	0.380939565	0.226024584	0.776698238	0.480614659	0.298892574	0.827293329
4	Formaldehyde	Air	kg C2H4	1.078774098	0.640073884	2.199514094	1.361041733	0.84642709	2.342793183
5	Methane	Air	kg C2H4	0.122495639	0.072680888	0.249756539	0.154547349	0.096112456	0.266025991
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.017954923	0.010653275	0.03660832	0.022652935	0.014087781	0.038993031
7	Propene	Air	kg C2H4	5.761357411	3.418412087	11.74684009	7.268850714	4.520472819	12.51204389
8	Toluene	Air	kg C2H4	0.498765058	0.295934513	1.016932809	0.62926989	0.391340742	1.083177079
9	VOC, volatile organic compounds	Air	kg C2H4	70.26937359	41.69324326	143.272329	88.65577155	55.13471405	152.6052671

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:00:31 PM					
Project	Thesis_Dredging Limited LCA									
Title:	Comparing product stages									
Method:	Eco-indicator 95 V2.03 /	Europe e								
Per sub-compartment:	No									
Skip unused:	Yes									
Indicator:	Characterization									
Category:	summer smog									
Cut-off:	0%									
Relative mode:	Non									

No	Substance	Compartment	Unit	CPD_20k_1.9_Avg	CPD_20k_1.9_High	CPD_20k_1.9_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low
	Total		kg C2H4	97.62324852	57.35193574	200.4974793	101.5442576	63.79966418	173.5511657
1	Acetaldehyde	Air	kg C2H4	1.076889593	0.632653632	2.211703176	1.120142546	0.703779022	1.91445631
2	Acrolein	Air	kg C2H4	0.148792822	0.087413157	0.305588948	0.154769042	0.097240486	0.264518628
3	Benzene	Air	kg C2H4	0.470009043	0.276122018	0.965299043	0.488886818	0.307164733	0.835565488
4	Formaldehyde	Air	kg C2H4	1.331007931	0.781943671	2.733608429	1.384467473	0.86985283	2.366218923
5	Methane	Air	kg C2H4	0.151136988	0.088790313	0.310403367	0.15720736	0.098772467	0.268686002
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.022153058	0.013014531	0.04549769	0.023042829	0.014477675	0.039382925
7	Propene	Air	kg C2H4	7.108450617	4.176089294	14.59925225	7.393959445	4.64558155	12.63715262
8	Toluene	Air	kg C2H4	0.615383933	0.361527201	1.263868282	0.640100648	0.4021715	1.094007837
9	VOC, volatile organic compounds	Air	kg C2H4	86.69942454	50.93438193	178.0622581	90.18168143	56.66062392	154.131177

SimaPro 7.1	Inventory	Date:	8/13/2008	Time: 3:03:18 PM
Project	Thesis_Dredging Limited LCA			

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	MBD_20k_2.3_Avg	MBD_20k_2.3_High	MBD_20k_2.3_Low
	Total		kg C2H4	116.1211314	67.75742553	239.6731147	103.2601297	65.51553634	175.2670379
1	Acetaldehyde	Air	kg C2H4	1.280941166	0.747437393	2.643852635	1.139070465	0.72270694	1.933384228
2	Acrolein	Air	kg C2H4	0.176986436	0.103272722	0.365298632	0.157384295	0.099855738	0.26713388
3	Benzene	Air	kg C2H4	0.559067462	0.326219453	1.153910907	0.497147918	0.315425833	0.843826588
4	Formaldehyde	Air	kg C2H4	1.583210445	0.923813457	3.267734083	1.407861895	0.893247252	2.389613344
5	Methane	Air	kg C2H4	0.17977478	0.104899738	0.371053751	0.159863815	0.101428921	0.271342457
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.026350672	0.015375786	0.054387582	0.023432202	0.014867048	0.039772298
7	Propene	Air	kg C2H4	8.455376566	4.933766501	17.45183167	7.518900918	4.770523023	12.76209409
8	Toluene	Air	kg C2H4	0.731988329	0.427119888	1.510818234	0.650916925	0.412987777	1.104824114
9	VOC, volatile organic compounds	Air	kg C2H4	103.1274355	60.17552059	212.8542272	91.70555131	58.18449381	155.6550469

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:06:10 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low	MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
	Total		kg C2H4	152.7493742	88.39612878	317.1538158	106.2623318	68.51773836	178.2692399
1	Acetaldehyde	Air	kg C2H4	1.684990142	0.975104522	3.498548231	1.172187987	0.755824463	1.96650175
2	Acrolein	Air	kg C2H4	0.232813503	0.134729275	0.483391119	0.161960112	0.104431555	0.271709697
3	Benzene	Air	kg C2H4	0.735414855	0.425584894	1.526943261	0.511602078	0.329879994	0.858280749
4	Formaldehyde	Air	kg C2H4	2.082604621	1.205204193	4.32411593	1.448794303	0.93417966	2.430545753
5	Methane	Air	kg C2H4	0.236481377	0.136851875	0.491006733	0.164511722	0.106076828	0.275990364
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.034662499	0.020059203	0.071969813	0.024113474	0.015548319	0.040453569
7	Propene	Air	kg C2H4	11.12246724	6.43657659	23.09359985	7.737506682	4.989128787	12.98069986
8	Toluene	Air	kg C2H4	0.96288038	0.557219292	1.999230362	0.669841791	0.431912643	1.12374898
9	VOC, volatile organic compounds	Air	kg C2H4	135.6570596	78.50479893	281.6650105	94.37181361	60.85075611	158.3213092

SimaPro 7.1 Inventory Date: 8/13/2008 Time: 2:28:13 PM
Project Thesis_Dredging Limited LCA

Title: Comparing product stages
Method: Eco-indicator 95 V2.03 / Europe e
Per sub-compartment: No
Skip unused: Yes
Indicator: Characterization
Category: summer smog
Cut-off: 0%
Relative mode: Non

No	Substance	Compartment	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low
	Total		kg C2H4	373.3181934	212.4304858	784.3258518	485.5987113	296.8757443	845.6286578
1	Acetaldehyde	Air	kg C2H4	4.118101818	2.343337092	8.651959034	5.356676881	3.274859259	9.328195021
2	Acrolein	Air	kg C2H4	0.568994255	0.323776682	1.195433042	0.740127006	0.452484224	1.288867933
3	Benzene	Air	kg C2H4	1.797347757	1.022750736	3.776152182	2.337924511	1.429314088	4.071295743
4	Formaldehyde	Air	kg C2H4	5.089868281	2.896304575	10.69359958	6.620715308	4.047642094	11.52940992
5	Methane	Air	kg C2H4	0.577958509	0.328877641	1.214266565	0.751787382	0.459612914	1.30917348
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.084714858	0.048205576	0.177982361	0.110194003	0.067368232	0.191893439
7	Propene	Air	kg C2H4	27.18321693	15.4681558	57.11079758	35.35893869	21.61704921	61.57457005
8	Toluene	Air	kg C2H4	2.353271599	1.339089918	4.944124834	3.061049999	1.87140426	5.330556985
9	VOC, volatile organic compounds	Air	kg C2H4	331.5447194	188.6599878	696.5615366	431.2612975	263.65601	751.0046953

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:31:49 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.9_Avg	CPD_100k_1.9_High	CPD_100k_1.9_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low
	Total		kg C2H4	465.8122016	264.4579347	980.1925436	494.1803691	305.4574021	854.2103156
1	Acetaldehyde	Air	kg C2H4	5.138410364	2.917255898	10.81257964	5.451341811	3.369524189	9.422859951
2	Acrolein	Air	kg C2H4	0.709969327	0.403074504	1.493963959	0.753206771	0.465563988	1.301947697
3	Benzene	Air	kg C2H4	2.242661972	1.273237909	4.719156208	2.379241071	1.470630648	4.112612303
4	Formaldehyde	Air	kg C2H4	6.350943489	3.605653508	13.36407125	6.737718735	4.164645521	11.64641335
5	Methane	Air	kg C2H4	0.721154582	0.409424765	1.517500704	0.765073212	0.472898744	1.322459311
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.105703969	0.060011853	0.222429214	0.112141387	0.069315616	0.193840823
7	Propene	Air	kg C2H4	33.91818119	19.25654183	71.37285838	35.98381331	22.24192384	62.19944467
8	Toluene	Air	kg C2H4	2.936322536	1.667053355	6.178802198	3.115145867	1.925500127	5.384652852
9	VOC, volatile organic compounds	Air	kg C2H4	413.6888542	234.8656811	870.5111821	438.882687	271.2773994	758.6260847

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:37:01 PM			
Project	Thesis_Dredging Limited LCA							

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	MBD_100k_2.3_Avg	MBD_100k_2.3_High	MBD_100k_2.3_Low
	Total		kg C2H4	558.3039128	316.4853836	1176.061532	502.7620269	314.0390599	862.7919734
1	Acetaldehyde	Air	kg C2H4	6.158693572	3.491174705	12.97322558	5.54600674	3.464189119	9.517524881
2	Acrolein	Air	kg C2H4	0.850940898	0.482372325	1.792498376	0.766286535	0.478643752	1.315027461
3	Benzene	Air	kg C2H4	2.687965128	1.523725081	5.662171293	2.42055763	1.511947207	4.153928862
4	Formaldehyde	Air	kg C2H4	7.611987379	4.31500244	16.03457425	6.854722161	4.281648947	11.76341677
5	Methane	Air	kg C2H4	0.864347098	0.489971889	1.8207384	0.778359043	0.486184574	1.335745141
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.126692558	0.07181813	0.266876589	0.114088771	0.071263	0.195788207
7	Propene	Air	kg C2H4	40.65297819	23.04492787	85.63508644	36.60868794	22.86679846	62.8243193
8	Toluene	Air	kg C2H4	3.519358993	1.995016792	7.413494041	3.169241734	1.979595995	5.43874872
9	VOC, volatile organic compounds	Air	kg C2H4	495.830949	281.0713744	1044.462867	446.5040764	278.8987888	766.2474741

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:41:18 PM				
Project	Thesis_Dredging Limited LCA								

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_3.0_Avg	CPD_100k_3.0_High	CPD_100k_3.0_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
	Total		kg C2H4	741.1396237	419.3642085	1563.152643	517.7799281	329.056961	877.8098746
1	Acetaldehyde	Air	kg C2H4	8.175568417	4.626038965	17.24325751	5.711670368	3.629852746	9.683188508
2	Acrolein	Air	kg C2H4	1.129610599	0.639175453	2.382484672	0.789176123	0.50153334	1.337917049
3	Benzene	Air	kg C2H4	3.568231241	2.019037199	7.525829032	2.49286161	1.584251187	4.226232842
4	Formaldehyde	Air	kg C2H4	10.10479299	5.717665574	21.31222426	7.059478158	4.486404944	11.96817277
5	Methane	Air	kg C2H4	1.147407117	0.649245381	2.420019671	0.801609246	0.509434777	1.358995344
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.168182369	0.095163804	0.354716853	0.117496693	0.074670922	0.199196129
7	Propene	Air	kg C2H4	53.96618628	30.53606402	113.8211803	37.70221853	23.96032905	63.91784989
8	Toluene	Air	kg C2H4	4.671893462	2.6435301	9.853585453	3.263909503	2.074263763	5.533416488
9	VOC, volatile organic compounds	Air	kg C2H4	658.2077512	372.438288	1388.239346	459.8415078	292.2362203	779.5849056

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:44:38 PM				
Project	Thesis_Dredging Limited LCA								

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	MBD_1k_1.5_Avg	MBD_1k_1.5_High	MBD_1k_1.5_Low
	Total		kg SPM	34.34891952	28.37964354	49.60468343	30.46889013	23.46778215	43.84006833
1	Particulates, < 10 um	Air	kg SPM	25.21356858	20.831866	36.41194847	22.3654619	17.22635073	32.18047569
2	Sulfur oxides	Air	kg SPM	9.135350936	7.547777536	13.19273495	8.103428226	6.241431424	11.65959264

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:47:32 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.9_Avg	CPD_1k_1.9_High	CPD_1k_1.9_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low
	Total		kg SPM	37.78551698	30.30686692	56.87867259	30.784409	23.78330103	44.15558721
1	Particulates, < 10 um	Air	kg SPM	27.73617736	22.24652998	41.75136605	22.59706618	17.45795501	32.41207997
2	Sulfur oxides	Air	kg SPM	10.04933962	8.060336948	15.12730654	8.18734282	6.325346018	11.74350724

SimaPro 7.1	Inventory	Date:	8/13/2008	Time: 2:50:51 PM
Project	Thesis_Dredging Limited LCA			

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High	MBD_1k_2.3_Low
	Total		kg SPM	41.2135869	32.24261785	64.15266175	31.09992788	24.0988199	44.47110608
1	Particulates, < 10 um	Air	kg SPM	30.25252655	23.66745353	47.09078363	22.82867046	17.68955929	32.64368425
2	Sulfur oxides	Air	kg SPM	10.96106035	8.575164322	17.06187813	8.271257414	6.409260612	11.82742183

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:53:40 PM				
Project	Thesis_Dredging Limited LCA								

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low	MBD_1k_3.0_Avg	MBD_1k_3.0_High	MBD_1k_3.0_Low
	Total		kg SPM	48.29144271	36.34436321	78.81149806	31.66274533	24.66163735	45.03392353
1	Particulates, < 10 um	Air	kg SPM	35.4479739	26.67830916	57.85099326	23.24180242	18.10269125	33.05681621
2	Sulfur oxides	Air	kg SPM	12.84346881	9.666054044	20.9605048	8.420942906	6.558946104	11.97710732

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:09:03 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	MBD_5k_1.5_Avg	MBD_5k_1.5_High	MBD_5k_1.5_Low
	Total		kg SPM	88.95926724	59.09583224	165.2466143	102.0746193	67.04349684	168.9049277
1	Particulates, < 10 um	Air	kg SPM	65.29988765	43.37885558	121.2980467	74.92711419	49.21277959	123.9834044
2	Sulfur oxides	Air	kg SPM	23.65937958	15.71697666	43.94856764	27.14750514	17.83071724	44.92152333

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:11:34 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.9_Avg	CPD_5k_1.9_High	CPD_5k_1.9_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low
	Total		kg SPM	106.1251995	68.74900426	201.6080326	103.6692688	68.63814628	170.4995772
1	Particulates, < 10 um	Air	kg SPM	77.90041237	50.46469462	147.988875	76.09765473	50.38332014	125.1539449
2	Sulfur oxides	Air	kg SPM	28.22478709	18.28430964	53.6191576	27.57161403	18.25482614	45.34563223

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:14:26 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High	MBD_5k_2.3_Low
	Total		kg SPM	123.2911317	78.41070382	237.9609233	105.2639182	70.23279572	172.0942266
1	Particulates, < 10 um	Air	kg SPM	90.50093708	57.55679323	174.6734437	77.26819528	51.55386069	126.3244855
2	Sulfur oxides	Air	kg SPM	32.7901946	20.85391059	63.28747961	27.99572293	18.67893503	45.76974112

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:18:07 PM				
Project	Thesis_Dredging Limited LCA								
Title:	Comparing product stages								
Method:	Eco-indicator 95 V2.03 / Europe e								
Per sub-compartment:	No								
Skip unused:	Yes								
Indicator:	Characterization								
Category:	winter smog								
Cut-off:	0%								
Relative mode:	Non								
No	Substance	Compartment	Unit	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low	MBD_5k_3.0_Avg	MBD_5k_3.0_High	MBD_5k_3.0_Low
	Total		kg SPM	157.5121381	97.77674062	310.0953598	108.0438953	73.01277282	174.8742037
1	Particulates, < 10 um	Air	kg SPM	115.620612	71.77228833	227.6231897	79.30881677	53.59448218	128.365107
2	Sulfur oxides	Air	kg SPM	41.8915261	26.00445229	82.47217017	28.73507854	19.41829064	46.50909673

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:57:28 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	MBD_20k_1.5_Avg	MBD_20k_1.5_High	MBD_20k_1.5_Low
	Total		kg SPM	293.7395436	174.2858037	598.905987	370.5982357	230.4737457	637.9194693
1	Particulates, < 10 um	Air	kg SPM	215.6173246	127.9331963	439.6224798	272.0348751	169.1775368	468.260036
2	Sulfur oxides	Air	kg SPM	78.12221905	46.35260736	159.2835072	98.56336056	61.29620897	169.6594333

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:00:17 PM				
Project	Thesis_Dredging Limited LCA								
Title:	Comparing product stages								
Method:	Eco-indicator 95 V2.03 / Europe e								
Per sub-compartment:	No								
Skip unused:	Yes								
Indicator:	Characterization								
Category:	winter smog								
Cut-off:	0%								
Relative mode:	Non								
No	Substance	Compartment	Unit	CPD_20k_1.9_Avg	CPD_20k_1.9_High	CPD_20k_1.9_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low
	Total		kg SPM	362.4203276	212.9155468	744.3346051	376.9768335	236.8523435	644.2980671
1	Particulates, < 10 um	Air	kg SPM	266.0319426	156.2890716	546.3732739	276.7170373	173.859699	472.9421982
2	Sulfur oxides	Air	kg SPM	96.388385	56.62647522	197.9613311	100.2597961	62.99264455	171.3558689

SimaPro 7.1	Inventory	Date:	8/13/2008	Time: 3:03:04 PM
Project	Thesis_Dredging Limited LCA			

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	MBD_20k_2.3_Avg	MBD_20k_2.3_High	MBD_20k_2.3_Low
	Total		kg SPM	431.092584	251.54529	889.7717506	383.3469037	243.2224137	650.6681373
1	Particulates, < 10 um	Air	kg SPM	316.440301	184.6449469	653.1303276	281.3929399	178.5356016	477.6181008
2	Sulfur oxides	Air	kg SPM	114.652283	66.90034308	236.641423	101.9539637	64.68681216	173.0500365

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:05:57 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low	MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
	Total		kg SPM	567.0726909	328.165211	1177.414105	394.4923947	254.3679048	661.8136283
1	Particulates, < 10 um	Air	kg SPM	416.2554859	240.8872293	864.272056	289.5742046	186.7168663	485.7993655
2	Sulfur oxides	Air	kg SPM	150.817205	87.27798165	313.1420493	104.9181901	67.6510385	176.0142629

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:27:59 PM				
Project	Thesis_Dredging Limited LCA								

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low
	Total		kg SPM	1385.920915	788.6351604	2911.76166	1802.755457	1102.133008	3139.34457
1	Particulates, < 10 um	Air	kg SPM	1017.324927	578.8917667	2137.356963	1323.299219	809.0125268	2304.412504
2	Sulfur oxides	Air	kg SPM	368.5959881	209.7433937	774.4046967	479.4562386	293.1204807	834.9320666

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:31:38 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.9_Avg	CPD_100k_1.9_High	CPD_100k_1.9_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low
	Total		kg SPM	1729.299253	981.7838762	3638.90475	1834.614336	1133.991886	3171.203449
1	Particulates, < 10 um	Air	kg SPM	1269.379239	720.6711431	2671.110934	1346.684991	832.3982995	2327.798276
2	Sulfur oxides	Air	kg SPM	459.920014	261.112733	967.7938165	487.9293447	301.5935868	843.4051726

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:36:44 PM				
Project	Thesis_Dredging Limited LCA								
Title:	Comparing product stages								
Method:	Eco-indicator 95 V2.03 / Europe e								
Per sub-compartment:	No								
Skip unused:	Yes								
Indicator:	Characterization								
Category:	winter smog								
Cut-off:	0%								
Relative mode:	Non								

No	Substance	Compartment	Unit	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	MBD_100k_2.3_Avg	MBD_100k_2.3_High	MBD_100k_2.3_Low
	Total		kg SPM	2072.669062	1174.932592	4366.056368	1866.473215	1165.850765	3203.062328
1	Particulates, < 10 um	Air	kg SPM	1521.42729	862.4505196	3204.871164	1370.070764	855.7840721	2351.184049
2	Sulfur oxides	Air	kg SPM	551.2417719	312.4820723	1161.185204	496.4024507	310.0666928	851.8782787

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:41:05 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_3.0_Avg	CPD_100k_3.0_High	CPD_100k_3.0_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
	Total		kg SPM	2751.435434	1556.863924	5803.108396	1922.226252	1221.603803	3258.815365
1	Particulates, < 10 um	Air	kg SPM	2019.670691	1142.80437	4259.728503	1410.995866	896.7091742	2392.109151
2	Sulfur oxides	Air	kg SPM	731.7647432	414.0595544	1543.379892	511.2303863	324.8946283	866.7062142

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	2:42:51 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	MBD_1k_1.5_Avg	MBD_1k_1.5_High	MBD_1k_1.5_Low
greenhouse	kg CO2	41131.58872	33983.59664	59399.81419	36485.39386	28101.8203	52496.89613
acidification	kg SO2	871.9988454	720.4598206	1259.289296	773.4984793	595.7648517	1112.945895
eutrophication	kg PO4	161.2820263	133.2538688	232.9139889	143.063724	110.1906992	205.8467968
carcinogens	kg B(a)P	0.020410267	0.016863299	0.029475303	0.018104738	0.013944651	0.026049946
winter smog	kg SPM	34.34891952	28.37964354	49.60468343	30.46889013	23.46778215	43.84006833
summer smog	kg C2H4	9.252386942	7.644474614	13.36175145	8.207243929	6.321392469	11.80896754

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	2:45:30 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_1k_1.9_Avg	CPD_1k_1.9_High	CPD_1k_1.9_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low
greenhouse	kg CO2	45246.78987	36291.37694	68110.15311	36863.2163	28479.64273	52874.71856
acidification	kg SO2	959.2420268	769.3852772	1443.950422	781.5083992	603.7747715	1120.955815
eutrophication	kg PO4	177.418237	142.3029597	267.0683008	144.5452123	111.6721875	207.3282851
carcinogens	kg B(a)P	0.022452307	0.018008463	0.033797537	0.01829222	0.014132134	0.026237428
winter smog	kg SPM	37.78551698	30.30686692	56.87867259	30.784409	23.78330103	44.15558721
summer smog	kg C2H4	10.17808504	8.163600594	15.32110747	8.292233581	6.406382121	11.8939572

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	2:48:50 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High	MBD_1k_2.3_Low
greenhouse	kg CO2	49351.77961	38609.36865	76820.49203	37241.03874	28857.46517	53252.541
acidification	kg SO2	1046.268724	818.5272181	1628.611548	789.518319	611.7846914	1128.965735
eutrophication	kg PO4	193.5144075	151.3920908	301.2226127	146.0267006	113.1536759	208.8097734
carcinogens	kg B(a)P	0.02448928	0.019158694	0.038119771	0.018479703	0.014319616	0.026424911
winter smog	kg SPM	41.2135869	32.24261785	64.15266175	31.09992788	24.0988199	44.47110608
summer smog	kg C2H4	11.10148612	8.685023592	17.2804635	8.377223232	6.491371772	11.97894685

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	2:51:43 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low	MBD_1k_3.0_Avg	MBD_1k_3.0_High	MBD_1k_3.0_Low
greenhouse	kg CO2	57827.25593	43521.06036	94373.9183	37914.99228	29531.41871	53926.49454
acidification	kg SO2	1225.95071	922.6561765	2000.748096	803.8062842	626.0726566	1143.2537
eutrophication	kg PO4	226.7477942	170.651439	370.0517595	148.6693555	115.7963307	211.4524283
carcinogens	kg B(a)P	0.02869497	0.021595968	0.046830111	0.018814131	0.014654045	0.026759339
winter smog	kg SPM	48.29144271	36.34436321	78.81149806	31.66274533	24.66163735	45.03392353
summer smog	kg C2H4	13.00801074	9.789889064	21.22903677	8.528826395	6.642974935	12.13055001

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:07:04 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	MBD_5k_1.5_Avg	MBD_5k_1.5_High	MBD_5k_1.5_Low
greenhouse	kg CO2	106525.5048	70765.1216	197876.8436	122230.6646	80282.16249	202257.5416
acidification	kg SO2	2258.364438	1500.236345	4195.033174	2591.317324	1701.999732	4287.904948
eutrophication	kg PO4	417.6996273	277.4787593	775.8994802	479.2814934	314.796249	793.0767367
carcinogens	kg B(a)P	0.052859956	0.035114982	0.098190206	0.060653151	0.039837517	0.100363991
winter smog	kg SPM	88.95926724	59.09583224	165.2466143	102.0746193	67.04349684	168.9049277
summer smog	kg C2H4	23.96248773	15.91833205	44.51160729	27.49530082	18.05915247	45.49702785

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:09:49 PM		
Project	Thesis_Dredging Limited LCA						

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_5k_1.9_Avg	CPD_5k_1.9_High	CPD_5k_1.9_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low
greenhouse	kg CO2	127081.0878	82324.44594	241418.3268	124140.1996	82191.69751	204167.0767
acidification	kg SO2	2694.147376	1745.296597	5118.122319	2631.799892	1742.482301	4328.387516
eutrophication	kg PO4	498.3006002	322.804294	946.6309997	486.7690154	322.2837711	800.5642588
carcinogens	kg B(a)P	0.063060023	0.040850936	0.119796308	0.061600699	0.040785064	0.101311538
winter smog	kg SPM	106.1251995	68.74900426	201.6080326	103.6692688	68.63814628	170.4995772
summer smog	kg C2H4	28.58638419	18.51855599	54.30609039	27.92484311	18.48869476	45.92657014

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:12:20 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High	MBD_5k_2.3_Low
greenhouse	kg CO2	147636.6707	93893.98169	284949.5986	126049.7346	84101.23254	206076.6117
acidification	kg SO2	3129.930314	1990.573332	6040.99498	2672.28246	1782.964869	4368.870084
eutrophication	kg PO4	578.9015732	368.169869	1117.322479	494.2565375	329.7712932	808.0517809
carcinogens	kg B(a)P	0.073260089	0.046591957	0.141397343	0.062548246	0.041732611	0.102259085
winter smog	kg SPM	123.2911317	78.41070382	237.9609233	105.2639182	70.23279572	172.0942266
summer smog	kg C2H4	33.21028064	21.12107695	64.09827647	28.35438541	18.91823706	46.35611243

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:15:32 PM		
Project	Thesis_Dredging Limited LCA						
Title:	Comparing product stages						
Method:	Eco-indicator 95 V2.03 / Europe e						
Indicator:	Characterization						
Skip categories:	With result = 0						
Relative mode:	Non						
Impact category	Unit	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low	MBD_5k_3.0_Avg	MBD_5k_3.0_High	MBD_5k_3.0_Low
greenhouse	kg CO2	188615.0882	117084.1103	371327.9772	129378.6567	87430.15457	209405.5337
acidification	kg SO2	3998.681895	2482.209226	7872.235852	2742.856348	1853.538757	4439.443973
eutrophication	kg PO4	739.5829961	459.10122	1456.022742	507.3096509	342.8244065	821.1048943
carcinogens	kg B(a)P	0.093594349	0.058099335	0.184259916	0.064200119	0.043384485	0.103910959
winter smog	kg SPM	157.5121381	97.77674062	310.0953598	108.0438953	73.01277282	174.8742037
summer smog	kg C2H4	42.42821232	26.33760394	83.52874845	29.10321315	19.6670648	47.10494018

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	2:55:47 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	MBD_20k_1.5_Avg	MBD_20k_1.5_High	MBD_20k_1.5_Low
greenhouse	kg CO2	351742.4789	208700.9459	717168.2569	443777.9826	275983.9742	763885.4908
acidification	kg SO2	7457.018925	4424.506555	15204.12684	9408.192111	5850.921746	16194.54261
eutrophication	kg PO4	1379.225591	818.3421187	2812.105083	1740.108139	1082.167161	2995.289112
carcinogens	kg B(a)P	0.174541224	0.103561329	0.355872359	0.22021097	0.136948431	0.379054328
winter smog	kg SPM	293.7395436	174.2858037	598.905987	370.5982357	230.4737457	637.9194693
summer smog	kg C2H4	79.12306867	46.94644596	161.3241409	99.82608841	62.08149501	171.8329965

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	2:58:24 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_20k_1.9_Avg	CPD_20k_1.9_High	CPD_20k_1.9_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low
greenhouse	kg CO2	433985.2335	254958.6661	891313.7668	451416.1227	283622.1144	771523.631
acidification	kg SO2	9200.583647	5405.180529	18896.05045	9570.122383	6012.852018	16356.47288
eutrophication	kg PO4	1701.709563	999.724338	3494.95108	1770.058227	1112.11725	3025.239201
carcinogens	kg B(a)P	0.215351624	0.126515279	0.442286631	0.224001158	0.14073862	0.382844516
winter smog	kg SPM	362.4203276	212.9155468	744.3346051	376.9768335	236.8523435	644.2980671
summer smog	kg C2H4	97.62324852	57.35193574	200.4974793	101.5442576	63.79966418	173.5511657

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:01:25 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	MBD_20k_2.3_Avg	MBD_20k_2.3_High	MBD_20k_2.3_Low
greenhouse	kg CO2	516217.7767	301216.3863	1065469.488	459044.0514	291250.043	779151.5596
acidification	kg SO2	10943.93188	6385.854504	22588.19055	9731.836171	6174.565806	16518.18667
eutrophication	kg PO4	2024.153495	1181.106557	4177.837118	1799.968275	1142.027298	3055.149249
carcinogens	kg B(a)P	0.256156956	0.149469228	0.528705971	0.22778628	0.144523741	0.386629638
winter smog	kg SPM	431.092584	251.54529	889.7717506	383.3469037	243.2224137	650.6681373
summer smog	kg C2H4	116.1211314	67.75742553	239.6731147	103.2601297	65.51553634	175.2670379

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:03:59 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low	MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
greenhouse	kg CO2	679049.0363	392965.9704	1409910.804	472390.3738	304596.3654	792497.882
acidification	kg SO2	14395.99087	8330.966129	29890.42318	10014.78118	6457.510814	16801.13168
eutrophication	kg PO4	2662.634923	1540.867979	5528.433947	1852.300849	1194.359872	3107.481823
carcinogens	kg B(a)P	0.336956885	0.194997095	0.699624221	0.234408976	0.151146437	0.393252333
winter smog	kg SPM	567.0726909	328.165211	1177.414105	394.4923947	254.3679048	661.8136283
summer smog	kg C2H4	152.7493742	88.39612878	317.1538158	106.2623318	68.51773836	178.2692399

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	2:25:43 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low
greenhouse	kg CO2	1659590.167	944362.0795	3486729.269	2158734.454	1319764.412	3759251.572
acidification	kg SO2	35183.68132	20020.6865	73919.43738	45765.65142	27979.2996	79696.97094
eutrophication	kg PO4	6507.457489	3702.960049	13671.89499	8464.663728	5174.958841	14740.48852
carcinogens	kg B(a)P	0.823519811	0.4686102	1.730180549	1.07120458	0.654891889	1.865411235
winter smog	kg SPM	1385.920915	788.6351604	2911.76166	1802.755457	1102.133008	3139.34457
summer smog	kg C2H4	373.3181934	212.4304858	784.3258518	485.5987113	296.8757443	845.6286578

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	2:29:53 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_100k_1.9_Avg	CPD_100k_1.9_High	CPD_100k_1.9_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low
greenhouse	kg CO2	2070773.306	1175650.68	4357456.818	2196884.309	1357914.267	3797401.427
acidification	kg SO2	43900.85548	24924.05637	92379.05544	46574.43684	28788.08502	80505.75636
eutrophication	kg PO4	8119.75723	4609.871145	17086.12498	8614.254008	5324.549122	14890.0788
carcinogens	kg B(a)P	1.027556607	0.583379948	2.162251913	1.090135255	0.673822563	1.884341909
winter smog	kg SPM	1729.299253	981.7838762	3638.90475	1834.614336	1133.991886	3171.203449
summer smog	kg C2H4	465.8122016	264.4579347	980.1925436	494.1803691	305.4574021	854.2103156

SimaPro 7.1 Impact assessment Date: 8/13/2008 Time: 2:34:04 PM
Project Thesis_Dredging Limited LCA

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	MBD_100k_2.3_Avg	MBD_100k_2.3_High	MBD_100k_2.3_Low
greenhouse	kg CO2	2481946.233	1406939.281	5228194.579	2235034.164	1396064.122	3835551.282
acidification	kg SO2	52617.81315	29827.42625	110838.89	47383.22226	29596.87044	81314.54178
eutrophication	kg PO4	9732.01693	5516.782242	20500.395	8763.844289	5474.139402	15039.66908
carcinogens	kg B(a)P	1.231588336	0.698149696	2.594328344	1.109065929	0.692753238	1.903272584
winter smog	kg SPM	2072.669062	1174.932592	4366.056368	1866.473215	1165.850765	3203.062328
summer smog	kg C2H4	558.3039128	316.4853836	1176.061532	502.7620269	314.0390599	862.7919734

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	2:38:56 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_100k_3.0_Avg	CPD_100k_3.0_High	CPD_100k_3.0_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
greenhouse	kg CO2	3294744.413	1864288.237	6949012.404	2301796.41	1462826.368	3902313.528
acidification	kg SO2	69849.31565	39523.32602	147320.6113	48798.59676	31012.24493	82729.91628
eutrophication	kg PO4	12919.09872	7310.10384	27247.93368	9025.62728	5735.922393	15301.45207
carcinogens	kg B(a)P	1.634914058	0.925094838	3.448230468	1.14219461	0.725881918	1.936401264
winter smog	kg SPM	2751.435434	1556.863924	5803.108396	1922.226252	1221.603803	3258.815365
summer smog	kg C2H4	741.1396237	419.3642085	1563.152643	517.7799281	329.056961	877.8098746

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:43:11 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	MBD_1k_1.5_Avg	MBD_1k_1.5_High	MBD_1k_1.5_Low
1	Acetaldehyde	Air	kg	0.19366944	0.160012884	0.279685981	0.171792678	0.132318346	0.247183364
2	Acrolein	Air	kg	0.023386498	0.01932231	0.033773401	0.020744776	0.015978064	0.029848557
3	Benzene	Air	kg	0.235692054	0.19473266	0.340372562	0.209068448	0.161028931	0.30081749
4	Butadiene	Air	kg	0.00990272	0.008181791	0.014300925	0.008784116	0.006765712	0.012638998
5	Carbon dioxide, fossil	Air	kg	41109.07921	33964.99891	59367.30729	36465.42702	28086.44141	52468.16689
6	Carbon monoxide	Air	kg	213.7672119	176.6179943	308.7099979	189.6202205	146.0494953	272.8344678
7	Formaldehyde	Air	kg	0.299639511	0.247567103	0.432721706	0.265792446	0.204718951	0.382434639
8	Methane	Air	kg	2.04631861	1.690702168	2.95517263	1.815167923	1.398080639	2.611748752
9	Nitric oxide	Air	kg	805.7379526	665.7139787	1163.599223	714.7223695	550.4942516	1028.376071
10	Nitrogen oxides	Air	kg	1.034121726	0.854408417	1.493417597	0.917308075	0.706530037	1.319865887
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	0.042570735	0.035172643	0.061478145	0.037761976	0.02908507	0.054333702
12	Particulates, < 10 um	Air	kg	25.21356858	20.831866	36.41194847	22.3654619	17.22635073	32.18047569
13	Propene	Air	kg	0.654091127	0.540420872	0.944599823	0.580205461	0.44688649	0.834826833
14	Sulfur oxides	Air	kg	9.135350936	7.547777536	13.19273495	8.103428226	6.241431424	11.65959264
15	Toluene	Air	kg	0.10359488	0.085591797	0.149605614	0.091892876	0.070777832	0.132219781
16	VOC, volatile organic compounds	Air	kg	20.64589312	17.05797723	29.815581	18.31374779	14.10563502	26.35067937
17	Xylene	Air	kg	0.072169272	0.059627443	0.104222606	0.064017083	0.049307308	0.092110782

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:45:59 PM				
Project	Thesis_Dredging Limited LCA								

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.9_Avg	CPD_1k_1.9_High	CPD_1k_1.9_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low
1	Acetaldehyde	Air	kg	0.213046	0.170879143	0.320698899	0.173571668	0.134097336	0.248962353
2	Acrolein	Air	kg	0.025726309	0.020634463	0.038725905	0.020959598	0.016192886	0.030063379
3	Benzene	Air	kg	0.259272962	0.207956693	0.390284509	0.211233445	0.163193927	0.302982487
4	Butadiene	Air	kg	0.010893484	0.008737405	0.016398	0.00887508	0.006856675	0.012729962
5	Carbon dioxide, fossil	Air	kg	45222.0283	36271.51627	68072.87943	36843.04269	28464.05708	52845.78256
6	Carbon monoxide	Air	kg	235.1545472	188.6118846	353.978973	191.583822	148.0130968	274.7980693
7	Formaldehyde	Air	kg	0.32961834	0.264379052	0.496175655	0.268544844	0.207471349	0.385187037
8	Methane	Air	kg	2.251052075	1.805515476	3.388516665	1.833964792	1.416877508	2.630545621
9	Nitric oxide	Air	kg	886.3517547	710.9217188	1334.228437	722.1236367	557.8955188	1035.777338
10	Nitrogen oxides	Air	kg	1.137585245	0.912430143	1.7124111	0.926807207	0.716029169	1.329365019
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	0.046829923	0.03756117	0.070493248	0.038153018	0.029476112	0.054724744
12	Particulates, < 10 um	Air	kg	27.73617736	22.24652998	41.75136605	22.59706618	17.45795501	32.41207997
13	Propene	Air	kg	0.719532717	0.577120125	1.083115148	0.586213746	0.452894775	0.840835118
14	Sulfur oxides	Air	kg	10.04933962	8.060336948	15.12730654	8.18734282	6.325346018	11.74350724
15	Toluene	Air	kg	0.113959511	0.091404221	0.171543656	0.092844468	0.071729424	0.133171372
16	VOC, volatile organic compounds	Air	kg	22.71150755	18.2163615	34.18771278	18.50339477	14.295282	26.54032635
17	Xylene	Air	kg	0.079389783	0.063676662	0.119505722	0.064680008	0.049970234	0.092773707

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:49:05 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High	MBD_1k_2.3_Low
1	Acetaldehyde	Air	kg	0.232374479	0.181793484	0.361711816	0.175350657	0.135876325	0.250741343
2	Acrolein	Air	kg	0.028060314	0.021952421	0.043678408	0.021174419	0.016407707	0.0302782
3	Benzene	Air	kg	0.282795357	0.22123924	0.440196456	0.213398441	0.165358924	0.305147483
4	Butadiene	Air	kg	0.011881789	0.009295478	0.018495076	0.008966043	0.006947639	0.012820925
5	Carbon dioxide, fossil	Air	kg	49324.77156	38588.23945	76778.45157	37220.65836	28841.67275	53223.39824
6	Carbon monoxide	Air	kg	256.4888121	200.6588451	399.2479481	193.5474235	149.9766983	276.7616708
7	Formaldehyde	Air	kg	0.359522779	0.28126539	0.559629603	0.271297243	0.210223748	0.387939436
8	Methane	Air	kg	2.455277518	1.920836808	3.8218607	1.852761661	1.435674377	2.64934249
9	Nitric oxide	Air	kg	966.7655225	756.3294932	1504.857651	729.5249039	565.296786	1043.178605
10	Nitrogen oxides	Air	kg	1.240792031	0.970708601	1.931404604	0.936306339	0.725528301	1.338864151
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	0.051078541	0.039960266	0.079508352	0.03854406	0.029867154	0.055115786
12	Particulates, < 10 um	Air	kg	30.25252655	23.66745353	47.09078363	22.82867046	17.68955929	32.64368425
13	Propene	Air	kg	0.784811921	0.613981765	1.221630474	0.592222031	0.45890306	0.846843403
14	Sulfur oxides	Air	kg	10.96106035	8.575164322	17.06187813	8.271257414	6.409260612	11.82742183
15	Toluene	Air	kg	0.124298424	0.097242363	0.193481698	0.093796059	0.072681015	0.134122964
16	VOC, volatile organic compounds	Air	kg	24.77199638	19.37987137	38.55984456	18.69304176	14.48492898	26.72997334
17	Xylene	Air	kg	0.086592377	0.067743798	0.134788837	0.065342934	0.050633159	0.093436632

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:52:12 PM				
Project	Thesis_Dredging Limited LCA								

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low	MBD_1k_3.0_Avg	MBD_1k_3.0_High	MBD_1k_3.0_Low
1	Acetaldehyde	Air	kg	0.272281539	0.204920346	0.444362702	0.17852399	0.139049657	0.253914675
2	Acrolein	Air	kg	0.03287928	0.024745098	0.053658892	0.021557614	0.016790902	0.030661395
3	Benzene	Air	kg	0.331361495	0.249384194	0.540781024	0.217260327	0.169220809	0.309009369
4	Butadiene	Air	kg	0.01392232	0.010478003	0.022721187	0.009128302	0.007109898	0.012983184
5	Carbon dioxide, fossil	Air	kg	57795.60963	43497.2432	94322.27162	37894.24308	29515.25747	53896.98295
6	Carbon monoxide	Air	kg	300.5371701	226.1856646	490.4758124	197.050064	153.4793388	280.2643113
7	Formaldehyde	Air	kg	0.421265777	0.317046573	0.687504558	0.276206927	0.215133432	0.39284912
8	Methane	Air	kg	2.876937013	2.165196106	4.695153076	1.886291211	1.469203927	2.68287204
9	Nitric oxide	Air	kg	1132.793949	852.5459667	1848.716524	742.7271643	578.4990464	1056.380866
10	Nitrogen oxides	Air	kg	1.453880669	1.094197318	2.372729144	0.953250737	0.742472699	1.355808549
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	0.059850565	0.045043812	0.097675952	0.039241594	0.030564689	0.05581332
12	Particulates, < 10 um	Air	kg	35.4479739	26.67830916	57.85099326	23.24180242	18.10269125	33.05681621
13	Propene	Air	kg	0.919592367	0.69208947	1.500772144	0.602939512	0.469620541	0.857560884
14	Sulfur oxides	Air	kg	12.84346881	9.666054044	20.9605048	8.420942906	6.558946104	11.97710732
15	Toluene	Air	kg	0.145644936	0.109613053	0.237692124	0.095493493	0.074378449	0.135820397
16	VOC, volatile organic compounds	Air	kg	29.0262395	21.84528214	47.37074086	19.03133097	14.8232182	27.06826255
17	Xylene	Air	kg	0.101463404	0.076361827	0.165587988	0.066525449	0.051815674	0.094619148

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:07:30 PM		
Project	Thesis_Dredging Limited LCA						

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	MBD_5k_1.5_Avg	MBD_5k_1.5_High	MBD_5k_1.5_Low
1	Acetaldehyde	Air	kg	0.501578847	0.333199905	0.931709634	0.575527109	0.378011206	0.952336295
2	Acrolein	Air	kg	0.060568012	0.04023546	0.112508333	0.069497613	0.045646636	0.1149991
3	Benzene	Air	kg	0.610411993	0.405497998	1.133873045	0.700405633	0.460032505	1.158975302
4	Butadiene	Air	kg	0.025646767	0.017037203	0.047640247	0.029427896	0.019328497	0.048694931
5	Carbon dioxide, fossil	Air	kg	106467.2081	70726.39497	197768.5544	122163.7731	80238.2276	202146.855
6	Carbon monoxide	Air	kg	553.6294823	367.7772538	1028.396483	635.2516203	417.2387835	1051.163646
7	Formaldehyde	Air	kg	0.77602765	0.515516834	1.441513018	0.890438169	0.584847526	1.473425965
8	Methane	Air	kg	5.299701027	3.520602772	9.84447915	6.081041151	3.994080663	10.06242123
9	Nitric oxide	Air	kg	2086.757279	1386.237341	3876.263665	2394.409953	1572.669261	3962.078358
10	Nitrogen oxides	Air	kg	2.678241769	1.779161758	4.974977856	3.073097582	2.018437192	5.085116441
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	0.110252709	0.073241111	0.204800325	0.126507374	0.083091142	0.209334299
12	Particulates, < 10 um	Air	kg	65.29988765	43.37885558	121.2980467	74.92711419	49.21277959	123.9834044
13	Propene	Air	kg	1.694011578	1.125335529	3.146717443	1.943761368	1.276679355	3.216381071
14	Sulfur oxides	Air	kg	23.65937958	15.71697666	43.94856764	27.14750514	17.83071724	44.92152333
15	Toluene	Air	kg	0.268297364	0.178230515	0.498376757	0.307852708	0.202200334	0.509410075
16	VOC, volatile organic compounds	Air	kg	53.47019786	35.52036725	99.32376286	61.35336162	40.29742097	101.5226427
17	Xylene	Air	kg	0.186909099	0.124164116	0.347193684	0.214465291	0.140862666	0.354880034

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:10:14 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.9_Avg	CPD_5k_1.9_High	CPD_5k_1.9_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low
1	Acetaldehyde	Air	kg	0.598365486	0.387627364	1.136726141	0.584518218	0.387002314	0.961327403
2	Acrolein	Air	kg	0.072255455	0.046807833	0.137265043	0.070583332	0.046732355	0.116084819
3	Benzene	Air	kg	0.728199507	0.471735189	1.383374266	0.711347642	0.470974514	1.169917311
4	Butadiene	Air	kg	0.030595669	0.019820192	0.058123167	0.02988763	0.019788232	0.049154665
5	Carbon dioxide, fossil	Air	kg	127011.5419	82279.3934	241286.2092	124072.2632	82146.71762	204055.345
6	Carbon monoxide	Air	kg	660.4600179	427.8528457	1254.688288	645.1757684	427.1629316	1061.087794
7	Formaldehyde	Air	kg	0.925773017	0.599725356	1.758708369	0.90434894	0.598758297	1.487336737
8	Methane	Air	kg	6.322352308	4.09568536	12.0106913	6.176041544	4.089081055	10.15742162
9	Nitric oxide	Air	kg	2489.426221	1612.676111	4729.209701	2431.816358	1610.075665	3999.484763
10	Nitrogen oxides	Air	kg	3.195045899	2.069783852	6.069688641	3.121106709	2.066446319	5.133125568
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	0.131527508	0.085204883	0.249865274	0.128483721	0.08506749	0.211310646
12	Particulates, < 10 um	Air	kg	77.90041237	50.46469462	147.988875	76.09765473	50.38332014	125.1539449
13	Propene	Air	kg	2.020894756	1.309156571	3.839131684	1.974127565	1.307045551	3.246747268
14	Sulfur oxides	Air	kg	28.22478709	18.28430964	53.6191576	27.57161403	18.25482614	45.34563223
15	Toluene	Air	kg	0.320069086	0.207344071	0.608041247	0.312662103	0.207009728	0.514219469
16	VOC, volatile organic compounds	Air	kg	63.78801882	41.3225398	121.1792962	62.31184772	41.25590707	102.4811288
17	Xylene	Air	kg	0.222975818	0.144446046	0.423591345	0.217815751	0.144213126	0.358230495

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:12:49 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High	MBD_5k_2.3_Low
1	Acetaldehyde	Air	kg	0.695152125	0.442102905	1.341694568	0.593509326	0.395993423	0.970318512
2	Acrolein	Air	kg	0.083942898	0.053386011	0.162015948	0.071669051	0.047818074	0.117170537
3	Benzene	Air	kg	0.845987021	0.538030893	1.632816974	0.722289652	0.481916524	1.180859321
4	Butadiene	Air	kg	0.035544571	0.022605639	0.068603628	0.030347364	0.020247966	0.049614399
5	Carbon dioxide, fossil	Air	kg	147555.8757	93842.59766	284793.6582	125980.7532	84055.20764	205963.835
6	Carbon monoxide	Air	kg	767.2905535	487.9815078	1480.927023	655.0999165	437.0870797	1071.011942
7	Formaldehyde	Air	kg	1.075518383	0.684008267	2.075829331	0.918259712	0.612669069	1.501247509
8	Methane	Air	kg	7.34500359	4.671275972	14.17639543	6.271041936	4.184081447	10.25242201
9	Nitric oxide	Air	kg	2892.095163	1839.314914	5581.955702	2469.222762	1647.48207	4036.891167
10	Nitrogen oxides	Air	kg	3.711850028	2.360662679	7.164142692	3.169115835	2.114455446	5.181134695
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	0.152802307	0.097179223	0.294919655	0.130460069	0.087043837	0.213286994
12	Particulates, < 10 um	Air	kg	90.50093708	57.55679323	174.6734437	77.26819528	51.55386069	126.3244855
13	Propene	Air	kg	2.347777933	1.493139998	4.53138354	2.004493762	1.337411748	3.277113464
14	Sulfur oxides	Air	kg	32.7901946	20.85391059	63.28747961	27.99572293	18.67893503	45.76974112
15	Toluene	Air	kg	0.371840807	0.236483346	0.717680019	0.317471498	0.211819123	0.519028864
16	VOC, volatile organic compounds	Air	kg	74.10583979	47.12983793	143.0297039	63.27033382	42.21439317	103.4396149
17	Xylene	Air	kg	0.259042537	0.164745894	0.499971089	0.221166211	0.147563587	0.361580955

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:16:06 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low	MBD_5k_3.0_Avg	MBD_5k_3.0_High	MBD_5k_3.0_Low
1	Acetaldehyde	Air	kg	0.888100353	0.551294389	1.748410008	0.609183665	0.411667762	0.985992851
2	Acrolein	Air	kg	0.107242307	0.066571398	0.211128756	0.073561801	0.049710824	0.119063288
3	Benzene	Air	kg	1.080801373	0.670914869	2.12778199	0.741365026	0.500991899	1.199934696
4	Butadiene	Air	kg	0.045410414	0.028188826	0.089399832	0.031148825	0.021049427	0.050415861
5	Carbon dioxide, fossil	Air	kg	188511.8675	117020.0353	371124.7658	129307.8534	87382.3079	209290.9353
6	Carbon monoxide	Air	kg	980.2617108	608.5041836	1929.848782	672.4008378	454.3880011	1088.312864
7	Formaldehyde	Air	kg	1.374042056	0.852946035	2.705087182	0.942510576	0.636919933	1.525498373
8	Methane	Air	kg	9.383701847	5.824997313	18.47376612	6.436657593	4.349697104	10.41803767
9	Nitric oxide	Air	kg	3694.832602	2293.592692	7274.045409	2534.433927	1712.693235	4102.102332
10	Nitrogen oxides	Air	kg	4.742120755	2.943703999	9.335849663	3.252810891	2.198150501	5.26482975
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	0.195214512	0.121180748	0.384320313	0.133905466	0.090489234	0.216732391
12	Particulates, < 10 um	Air	kg	115.620612	71.77228833	227.6231897	79.30881677	53.59448218	128.365107
13	Propene	Air	kg	2.999433269	1.861918784	5.905007384	2.057431623	1.39034961	3.330051326
14	Sulfur oxides	Air	kg	41.8915261	26.00445229	82.47217017	28.73507854	19.41829064	46.50909673
15	Toluene	Air	kg	0.475049906	0.294890489	0.93523441	0.325855791	0.220203416	0.527413157
16	VOC, volatile organic compounds	Air	kg	94.67484899	58.77006218	186.3871046	64.9412775	43.88533686	105.1105586
17	Xylene	Air	kg	0.330943056	0.205435173	0.651530144	0.22700712	0.153404496	0.367421864

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:56:01 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	MBD_20k_1.5_Avg	MBD_20k_1.5_High	MBD_20k_1.5_Low
1	Acetaldehyde	Air	kg	1.656191044	0.982675276	3.376810352	2.089543244	1.29947963	3.596779987
2	Acrolein	Air	kg	0.199992881	0.118662675	0.407765778	0.252322203	0.156918295	0.434328149
3	Benzene	Air	kg	2.015553252	1.19589727	4.109514485	2.542934702	1.581442192	4.37721338
4	Butadiene	Air	kg	0.084684485	0.050246226	0.172663322	0.106842683	0.066445091	0.183910826
5	Carbon dioxide, fossil	Air	kg	351549.9857	208586.7331	716775.7823	443535.1225	275832.9404	763467.45
6	Carbon monoxide	Air	kg	1828.059926	1084.651012	3727.234068	2306.382637	1434.33129	3970.03074
7	Formaldehyde	Air	kg	2.562408785	1.520365521	5.224499036	3.232878226	2.010515654	5.564829413
8	Methane	Air	kg	17.49937707	10.38298405	35.67950561	22.07819276	13.73035081	38.00371307
9	Nitric oxide	Air	kg	6890.37972	4088.299969	14048.80533	8693.288401	5406.325632	14963.96202
10	Nitrogen oxides	Air	kg	8.843435197	5.247115153	18.03089301	11.15737242	6.938730856	19.20544785
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	0.364049541	0.21600315	0.742261143	0.45930526	0.285640334	0.790612959
12	Particulates, < 10 um	Air	kg	215.6173246	127.9331963	439.6224798	272.0348751	169.1775368	468.260036
13	Propene	Air	kg	5.593550884	3.318846687	11.40469911	7.057136616	4.388808563	12.14761543
14	Sulfur oxides	Air	kg	78.12221905	46.35260736	159.2835072	98.56336056	61.29620897	169.6594333
15	Toluene	Air	kg	0.885905964	0.525638567	1.806274971	1.117708509	0.69509901	1.923937974
16	VOC, volatile organic compounds	Air	kg	176.5562151	104.7568926	359.9807262	222.7531949	138.5294323	383.4303193
17	Xylene	Air	kg	0.617165531	0.366185598	1.258339707	0.778650548	0.484240051	1.340309523

SimaPro 7.1	Inventory	Date:	8/13/2008 Time: 2:58:53 PM
Project	Thesis_Dredging Limited LCA		

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.9_Avg	CPD_20k_1.9_High	CPD_20k_1.9_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low
1	Acetaldehyde	Air	kg	2.043433762	1.200481275	4.19678022	2.125507678	1.335444064	3.632744421
2	Acrolein	Air	kg	0.246754266	0.144963777	0.506781008	0.256665078	0.16126117	0.438671024
3	Benzene	Air	kg	2.486820333	1.460963061	5.107402343	2.58670274	1.625210229	4.420981418
4	Butadiene	Air	kg	0.104485009	0.061383099	0.214590083	0.108681619	0.068284027	0.185749762
5	Carbon dioxide, fossil	Air	kg	433747.7325	254819.1385	890825.9901	451169.0826	283466.9005	771101.4101
6	Carbon monoxide	Air	kg	2255.488209	1325.05952	4632.295148	2346.07923	1474.027882	4009.727332
7	Formaldehyde	Air	kg	3.161539028	1.857348387	6.493131661	3.288521313	2.066158741	5.6204725
8	Methane	Air	kg	21.59099824	12.68433045	44.34333817	22.45819433	14.11035238	38.38371464
9	Nitric oxide	Air	kg	8501.455557	4994.455114	17460.18941	8842.914019	5555.951249	15113.58764
10	Nitrogen oxides	Air	kg	10.91116518	6.410116994	22.40922268	11.34940892	7.130767363	19.39748436
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	0.449169874	0.263879375	0.922499803	0.46721065	0.293545724	0.798518349
12	Particulates, < 10 um	Air	kg	266.0319426	156.2890716	546.3732739	276.7170373	173.859699	472.9421982
13	Propene	Air	kg	6.901408366	4.054455625	14.17403131	7.178601403	4.51027335	12.26908021
14	Sulfur oxides	Air	kg	96.388385	56.62647522	197.9613311	100.2597961	62.99264455	171.3558689
15	Toluene	Air	kg	1.093044286	0.642144229	2.244881495	1.136946088	0.714336589	1.943175553
16	VOC, volatile organic compounds	Air	kg	217.8377501	127.975834	447.3926084	226.5871393	142.3633767	387.2642637
17	Xylene	Air	kg	0.761468242	0.447349154	1.563894516	0.792052389	0.497641892	1.353711364

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:01:37 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	MBD_20k_2.3_Avg	MBD_20k_2.3_High	MBD_20k_2.3_Low
1	Acetaldehyde	Air	kg	2.430628399	1.418287273	5.016798168	2.161424031	1.371360418	3.668660774
2	Acrolein	Air	kg	0.293509844	0.171264878	0.605802043	0.261002147	0.165598239	0.443008094
3	Benzene	Air	kg	2.958028901	1.726028851	6.105348714	2.630412265	1.668919754	4.464690942
4	Butadiene	Air	kg	0.124283075	0.072519972	0.256519303	0.110518097	0.070120504	0.18758624
5	Carbon dioxide, fossil	Air	kg	515935.2734	301051.5438	1064886.404	458792.8369	291090.6547	778725.1644
6	Carbon monoxide	Air	kg	2682.863422	1565.468028	5537.409299	2385.722752	1513.671405	4049.370855
7	Formaldehyde	Air	kg	3.760594882	2.194331253	7.761838676	3.344090011	2.121727439	5.676041198
8	Methane	Air	kg	25.68211139	14.98567685	53.00767876	22.83768788	14.48984592	38.76320818
9	Nitric oxide	Air	kg	10112.33136	5900.610259	20871.77351	8992.339603	5705.376833	15263.01322
10	Nitrogen oxides	Air	kg	12.97863843	7.573118836	26.78780909	11.5411887	7.322547137	19.58926413
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	0.534279639	0.311755599	1.102749031	0.475105471	0.301440545	0.80641317
12	Particulates, < 10 um	Air	kg	316.440301	184.6449469	653.1303276	281.3929399	178.5356016	477.6181008
13	Propene	Air	kg	8.209103462	4.790064564	16.94352589	7.299903804	4.631575751	12.39038262
14	Sulfur oxides	Air	kg	114.652283	66.90034308	236.641423	101.9539637	64.68681216	173.0500365
15	Toluene	Air	kg	1.300156889	0.75864989	2.683513737	1.156157949	0.73354845	1.962387414
16	VOC, volatile organic compounds	Air	kg	259.1141595	151.1947754	534.8096161	230.4159581	146.1921955	391.0930825
17	Xylene	Air	kg	0.905753036	0.52851271	1.869467242	0.805436314	0.511025816	1.367095289

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:04:28 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low	MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
1	Acetaldehyde	Air	kg	3.197324747	1.850293211	6.638611444	2.22426563	1.434202016	3.731502373
2	Acrolein	Air	kg	0.386092045	0.223431633	0.801643646	0.268590567	0.173186659	0.450596513
3	Benzene	Air	kg	3.89108389	2.251771926	8.079064871	2.706889304	1.745396793	4.541167982
4	Butadiene	Air	kg	0.16348585	0.094609332	0.339445981	0.113731318	0.073333726	0.190799461
5	Carbon dioxide, fossil	Air	kg	678677.4227	392750.9174	1409139.222	472131.8554	304429.6732	792064.1829
6	Carbon monoxide	Air	kg	3529.122598	2042.304771	7327.523953	2455.085648	1583.034301	4118.733751
7	Formaldehyde	Air	kg	4.946804325	2.862717798	10.27105922	3.441316635	2.218954063	5.773267822
8	Methane	Air	kg	33.78305393	19.55026789	70.14381904	23.50167458	15.15383262	39.42719488
9	Nitric oxide	Air	kg	13302.07748	7697.917981	27619.12875	9253.784365	5966.821596	15524.45798
10	Nitrogen oxides	Air	kg	17.07250761	9.879867522	35.44767998	11.87673912	7.658097558	19.92481456
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	0.702808175	0.406715394	1.45924195	0.488918766	0.315253839	0.820226465
12	Particulates, < 10 um	Air	kg	416.2554859	240.8872293	864.272056	289.5742046	186.7168663	485.7993655
13	Propene	Air	kg	10.79851188	6.249103486	22.42097073	7.51214241	4.843814356	12.60262122
14	Sulfur oxides	Air	kg	150.817205	87.27798165	313.1420493	104.9181901	67.6510385	176.0142629
15	Toluene	Air	kg	1.710267105	0.989732312	3.551030839	1.189772276	0.767162777	1.996001741
16	VOC, volatile organic compounds	Air	kg	340.8468834	197.2482385	707.7010313	237.1151096	152.891347	397.7922341
17	Xylene	Air	kg	1.19145592	0.689496055	2.473822189	0.828853702	0.534443204	1.390512677

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:26:42 PM				
Project	Thesis_Dredging Limited LCA								

Title: Comparing product stages
Method: Eco-indicator 95 V2.03 / Europe e
Per sub-compartment: No
Default units: Yes
Indicator: Inventory
Relative mode: Non

No	Substance	Compartment	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low
1	Acetaldehyde	Air	kg	7.814234948	4.446559947	16.41737957	10.16447226	6.214154191	17.70055981
2	Acrolein	Air	kg	0.94360573	0.536943088	1.982476024	1.227407971	0.750388431	2.137426091
3	Benzene	Air	kg	9.509776494	5.411379558	19.97964118	12.36997096	7.562508403	21.54124732
4	Butadiene	Air	kg	0.399558051	0.227361839	0.839454691	0.519730563	0.317742601	0.90506636
5	Carbon dioxide, fossil	Air	kg	1658681.947	943845.2717	3484821.135	2157553.074	1319042.163	3757194.3
6	Carbon monoxide	Air	kg	8625.146122	4907.995413	18121.0699	11219.27598	6859.019249	19537.41036
7	Formaldehyde	Air	kg	12.08994841	6.879583314	25.40047405	15.72616463	9.614351768	27.38577178
8	Methane	Air	kg	82.56550134	46.98252019	173.4666521	107.3981975	65.65898768	187.0247829
9	Nitric oxide	Air	kg	32510.16615	18499.36733	68302.49425	42288.04025	25853.2264	73641.00827
10	Nitrogen oxides	Air	kg	41.72506586	23.74295217	87.66261167	54.27444621	33.18123842	94.51430994
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	1.717657305	0.977404215	3.608725887	2.234266072	1.36594144	3.89078343
12	Particulates, < 10 um	Air	kg	1017.324927	578.8917667	2137.356963	1323.299219	809.0125268	2304.412504
13	Propene	Air	kg	26.39147275	15.01762699	55.44737629	34.32906669	20.98742642	59.78113597
14	Sulfur oxides	Air	kg	368.5959881	209.7433937	774.4046967	479.4562386	293.1204807	834.9320666
15	Toluene	Air	kg	4.179878505	2.378490085	8.781749261	5.437033746	3.323986251	9.468129635
16	VOC, volatile organic compounds	Air	kg	833.0269332	474.0200698	1750.154615	1083.571099	662.4522864	1886.946471
17	Xylene	Air	kg	2.911908306	1.65697281	6.117797104	3.787704285	2.315651798	6.595963326

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:30:19 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.9_Avg	CPD_100k_1.9_High	CPD_100k_1.9_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low
1	Acetaldehyde	Air	kg	9.750304296	5.53558994	20.51722891	10.34410211	6.393784039	17.88018966
2	Acrolein	Air	kg	1.177395236	0.668448597	2.47755217	1.249099122	0.772079582	2.159117242
3	Benzene	Air	kg	11.86593636	6.736708512	24.96908047	12.58857709	7.781114538	21.75985345
4	Butadiene	Air	kg	0.498553295	0.283046203	1.049088497	0.52891541	0.326927448	0.914251207
5	Carbon dioxide, fossil	Air	kg	2069640.063	1175007.299	4355072.174	2195682.051	1357171.14	3795323.277
6	Carbon monoxide	Air	kg	10762.12833	6110.037953	22646.37531	11417.54667	7057.28993	19735.68104
7	Formaldehyde	Air	kg	15.08537646	8.564497643	31.74363718	16.00408251	9.892269646	27.66368966
8	Methane	Air	kg	103.0220831	58.4892522	216.7858149	109.2961732	67.55696343	188.9227587
9	Nitric oxide	Air	kg	40564.94523	23030.14305	85359.41461	43035.3682	26600.55435	74388.33623
10	Nitrogen oxides	Air	kg	52.06294558	29.55796138	109.55426	55.23360182	34.14039402	95.47346554
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	2.143227265	1.216785336	4.509919185	2.273750746	1.405426114	3.930268104
12	Particulates, < 10 um	Air	kg	1269.379239	720.6711431	2671.110934	1346.684991	832.3982995	2327.798276
13	Propene	Air	kg	32.930273	18.69567168	69.29403726	34.93574108	21.59410081	60.38781036
14	Sulfur oxides	Air	kg	459.920014	261.112733	967.7938165	487.9293447	301.5935868	843.4051726
15	Toluene	Air	kg	5.215492959	2.961018392	10.97478188	5.533118769	3.420071274	9.564214658
16	VOC, volatile organic compounds	Air	kg	1039.419232	590.1147766	2187.214025	1102.720319	681.6015061	1906.09569
17	Xylene	Air	kg	3.63336811	2.062790591	7.64557115	3.854641823	2.382589335	6.662900864

SimaPro 7.1	Inventory	Date:	8/13/2008 Time: 2:34:16 PM
Project	Thesis_Dredging Limited LCA		

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	MBD_100k_2.3_Avg	MBD_100k_2.3_High	MBD_100k_2.3_Low
1	Acetaldehyde	Air	kg	11.68632556	6.624619933	24.61712633	10.52373196	6.573413887	18.05981951
2	Acrolein	Air	kg	1.411178936	0.799954105	2.972634123	1.270790274	0.793770734	2.180808393
3	Benzene	Air	kg	14.22203771	8.062037466	29.95857827	12.80718323	7.999720674	21.97845959
4	Butadiene	Air	kg	0.597546081	0.338730566	1.258724761	0.538100257	0.336112295	0.923436054
5	Carbon dioxide, fossil	Air	kg	2480587.973	1406169.325	5225333.419	2233811.028	1395300.118	3833452.254
6	Carbon monoxide	Air	kg	12899.05746	7312.080492	27171.73378	11615.81735	7255.560611	19933.95172
7	Formaldehyde	Air	kg	18.08073012	10.24941197	38.0868747	16.28200038	10.17018752	27.94160754
8	Methane	Air	kg	123.4781569	69.9959842	260.1054857	111.194149	69.45493919	190.8207344
9	Nitric oxide	Air	kg	48619.52428	27560.91878	102416.535	43782.69615	27347.8823	75135.66418
10	Nitrogen oxides	Air	kg	62.40056858	35.37297059	131.4461651	56.19275742	35.09954962	96.43262115
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	2.568786657	1.456166457	5.411123052	2.31323542	1.444910788	3.969752779
12	Particulates, < 10 um	Air	kg	1521.42729	862.4505196	3204.871164	1370.070764	855.7840721	2351.184049
13	Propene	Air	kg	39.46891087	22.37371638	83.14086062	35.54241547	22.2007752	60.99448475
14	Sulfur oxides	Air	kg	551.2417719	312.4820723	1161.185204	496.4024507	310.0666928	851.8782787
15	Toluene	Air	kg	6.251081693	3.5435467	13.16784022	5.629203791	3.516156296	9.66029968
16	VOC, volatile organic compounds	Air	kg	1245.806404	706.2094834	2624.278561	1121.869539	700.7507257	1925.24491
17	Xylene	Air	kg	4.354809998	2.468608371	9.173363113	3.921579361	2.449526873	6.729838401

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	2:39:29 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_3.0_Avg	CPD_100k_3.0_High	CPD_100k_3.0_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
1	Acetaldehyde	Air	kg	15.51341256	8.778062553	32.71965372	10.83808419	6.887766121	18.37417174
2	Acrolein	Air	kg	1.873317743	1.059992459	3.951052525	1.308749789	0.831730249	2.218767908
3	Benzene	Air	kg	18.87953037	10.6827365	39.81920123	13.18974397	8.382281411	22.36102033
4	Butadiene	Air	kg	0.793232982	0.448840557	1.673023803	0.554173739	0.352185777	0.939509536
5	Carbon dioxide, fossil	Air	kg	3292941.344	1863267.995	6945209.516	2300536.738	1462025.828	3900177.964
6	Carbon monoxide	Air	kg	17123.29499	9688.993572	36115.08948	11962.79104	7602.534303	20280.92541
7	Formaldehyde	Air	kg	24.00188358	13.58115338	50.62286047	16.76835667	10.65654381	28.42796383
8	Methane	Air	kg	163.9153025	92.74934018	345.7170959	114.5156065	72.77639675	194.142192
9	Nitric oxide	Air	kg	64541.65035	36520.0527	136126.1065	45090.52007	28655.70622	76443.48809
10	Nitrogen oxides	Air	kg	82.83576893	46.87154156	174.7106038	57.87127973	36.77807193	98.11114345
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	3.410023703	1.929517523	7.192150299	2.3823336	1.514008968	4.038850958
12	Particulates, < 10 um	Air	kg	2019.670691	1142.80437	4259.728503	1410.995866	896.7091742	2392.109151
13	Propene	Air	kg	52.39435561	29.64666409	110.5060003	36.60409566	23.26245539	62.05616494
14	Sulfur oxides	Air	kg	731.7647432	414.0595544	1543.379892	511.2303863	324.8946283	866.7062142
15	Toluene	Air	kg	8.298212188	4.695435347	17.50192798	5.79735258	3.684305085	9.828448469
16	VOC, volatile organic compounds	Air	kg	1653.78832	935.7745929	3488.038557	1155.380673	734.2618601	1958.756044
17	Xylene	Air	kg	5.780941471	3.27107048	12.19270115	4.038720052	2.566667564	6.846979092

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	2:42:38 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Single score
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	MBD_1k_1.5_Avg	MBD_1k_1.5_High	MBD_1k_1.5_Low
Total	Pt	128.3165055	106.0172121	185.3071282	113.8219648	87.6680792	163.772382
greenhouse	Pt	7.866416342	6.499362857	11.36021446	6.977831577	5.374473131	10.04003138
acidification	Pt	77.43349747	63.97683207	111.8248895	68.68666496	52.90391883	98.82959545
eutrophication	Pt	21.12794545	17.45625682	30.51173254	18.74134784	14.4349816	26.96593038
carcinogens	Pt	18.77744549	15.514235	27.11727915	16.65635867	12.82907894	23.96595016
winter smog	Pt	1.820492735	1.504121107	2.629048222	1.614851177	1.243792454	2.323523622
summer smog	Pt	1.290707978	1.066404209	1.863964327	1.144910528	0.881834249	1.647350973

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	2:45:43 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Single score
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_1k_1.9_Avg	CPD_1k_1.9_High	CPD_1k_1.9_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low
Total	Pt	141.1545272	113.2166982	212.48041	115.0006417	88.84675614	164.9510589
greenhouse	Pt	8.653448563	6.940725839	13.02606678	7.050090118	5.446731673	10.11228993
acidification	Pt	85.18069198	68.32141261	128.2227974	69.39794585	53.61519971	99.54087634
eutrophication	Pt	23.24178905	18.64168772	34.98594741	18.93542281	14.62905657	27.16000535
carcinogens	Pt	20.65612238	16.56778582	31.09373421	16.82884266	13.00156293	24.13843415
winter smog	Pt	2.0026324	1.606263947	3.014569647	1.631573677	1.260514954	2.340246122
summer smog	Pt	1.419842863	1.138822283	2.137294493	1.156766584	0.893690306	1.659207029

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	2:48:38 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Single score
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High	MBD_1k_2.3_Low
Total	Pt	153.9606929	120.4480405	239.6536918	116.1793186	90.02543308	166.1297358
greenhouse	Pt	9.43852785	7.384041755	14.6919191	7.122348659	5.518990214	10.18454847
acidification	Pt	92.90866268	72.68521696	144.6207054	70.10922673	54.3264806	100.2521572
eutrophication	Pt	25.35038738	19.83236389	39.46016227	19.12949778	14.82313154	27.35408032
carcinogens	Pt	22.53013755	17.62599836	35.07018928	17.00132664	13.17404691	24.31091813
winter smog	Pt	2.184320106	1.708858746	3.400091073	1.648296177	1.277237455	2.356968622
summer smog	Pt	1.548657314	1.211560791	2.410624658	1.168622641	0.905546362	1.671063085

SimaPro 7.1 Impact assessment Date: 8/13/2008 Time: 2:51:57 PM
Project Thesis_Dredging Limited LCA

Title: Comparing product stages
Method: Eco-indicator 95 V2.03 / Europe e
Indicator: Single score
Skip categories: With result = 0
Relative mode: Non

Impact category	Unit	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low	MBD_1k_3.0_Avg	MBD_1k_3.0_High	MBD_1k_3.0_Low
Total	Pt	180.4012836	135.7708407	294.4143852	118.2818234	92.12793788	168.2322407
greenhouse	Pt	11.0594627	8.323402793	18.04901188	7.251242274	5.647883829	10.31344208
acidification	Pt	108.8644231	81.93186847	177.6664309	71.37799804	55.59525191	101.5209285
eutrophication	Pt	29.70396104	22.35533851	48.4767805	19.47568556	15.16931933	27.7002681
carcinogens	Pt	26.39937284	19.86829014	43.08370189	17.30900077	13.48172104	24.61859226
winter smog	Pt	2.559446464	1.92625125	4.177009397	1.678125502	1.30706678	2.386797947
summer smog	Pt	1.814617498	1.365689524	2.96145063	1.189771282	0.926695003	1.692211726

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:07:18 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Single score
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	MBD_5k_1.5_Avg	MBD_5k_1.5_High	MBD_5k_1.5_Low
Total	Pt	332.323184	220.7630047	617.3081536	381.3179172	250.452921	630.9744349
greenhouse	Pt	20.3730028	13.53382951	37.84394634	23.3766146	15.35396358	38.68175484
acidification	Pt	200.5427621	133.2209875	372.5189459	230.1089783	151.1375762	380.7659594
eutrophication	Pt	54.71865118	36.34971747	101.6428319	62.78587563	41.23830862	103.8930525
carcinogens	Pt	48.63115972	32.30578382	90.33498974	55.80089933	36.6505155	92.3348716
winter smog	Pt	4.714841164	3.132079109	8.758070559	5.409954824	3.553305332	8.95196117
summer smog	Pt	3.342767039	2.220607321	6.209369217	3.835594464	2.519251769	6.346835385

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:10:03 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Single score
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_5k_1.9_Avg	CPD_5k_1.9_High	CPD_5k_1.9_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low
Total	Pt	396.4495806	256.8241477	753.1427066	387.2750141	256.410018	636.9315318
greenhouse	Pt	24.30425804	15.74455029	46.171255	23.74181318	15.71916215	39.04695341
acidification	Pt	239.240287	154.9823378	454.489262	233.7038304	154.7324283	384.3608114
eutrophication	Pt	65.27737863	42.28736252	124.008661	63.76674102	42.21917401	104.8739179
carcinogens	Pt	58.01522073	37.58286135	110.2126033	56.6726427	37.52225887	93.20661497
winter smog	Pt	5.624635571	3.643697226	10.68522573	5.494471245	3.637821753	9.03647759
summer smog	Pt	3.987800594	2.583338561	7.57569961	3.895515614	2.579172919	6.406756535

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:12:36 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Single score
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High	MBD_5k_2.3_Low
Total	Pt	460.5759772	292.9171469	888.9454034	393.2321111	262.3671149	642.8886288
greenhouse	Pt	28.23551328	17.957224	54.49661073	24.10701175	16.08436072	39.41215199
acidification	Pt	277.9378119	176.7629119	536.4403542	237.2986824	158.3272803	387.9556635
eutrophication	Pt	75.83610609	48.23025283	146.3692447	64.74760641	43.20003941	105.8547833
carcinogens	Pt	67.39928175	42.86460061	130.0855552	57.54438608	38.39400225	94.07835834
winter smog	Pt	6.534429979	4.155767302	12.61192894	5.578987665	3.722338173	9.120994011
summer smog	Pt	4.632834149	2.946390234	8.941709568	3.955436764	2.639094069	6.466677685

SimaPro 7.1 Impact assessment Date: 8/13/2008 Time: 3:15:49 PM
Project Thesis_Dredging Limited LCA

Title: Comparing product stages
Method: Eco-indicator 95 V2.03 / Europe e
Indicator: Single score
Skip categories: With result = 0
Relative mode: Non

Impact category	Unit	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low	MBD_5k_3.0_Avg	MBD_5k_3.0_High	MBD_5k_3.0_Low
Total	Pt	588.4146406	365.2624259	1158.416436	403.6172106	272.7522144	653.2737283
greenhouse	Pt	36.07263561	22.39233609	71.01647564	24.74366809	16.72101706	40.04880832
acidification	Pt	355.0829523	220.4201792	699.0545437	243.5656437	164.5942416	394.2226248
eutrophication	Pt	96.88537249	60.14225981	190.7389792	66.45756426	44.90999725	107.5647411
carcinogens	Pt	86.1068013	53.45138778	169.5191231	59.06410982	39.91372599	95.59808209
winter smog	Pt	8.348143322	5.182167253	16.43505407	5.726326451	3.86967696	9.268332797
summer smog	Pt	5.918735618	3.67409575	11.65226041	4.059898234	2.743555539	6.571139155

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	2:55:28 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Single score
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	MBD_20k_1.5_Avg	MBD_20k_1.5_High	MBD_20k_1.5_Low
Total	Pt	1097.316372	651.0756551	2237.319963	1384.435703	860.9757183	2383.061774
greenhouse	Pt	67.27074909	39.91405591	137.1584291	84.87253918	52.78193507	146.0931001
acidification	Pt	662.1832805	392.896182	1350.126463	835.4474594	519.5618511	1438.075384
eutrophication	Pt	180.6785524	107.2028176	368.3857658	227.9541662	141.7638981	392.3828737
carcinogens	Pt	160.5779263	95.27642277	327.4025699	202.5940922	125.9925569	348.7299813
winter smog	Pt	15.56819581	9.237147594	31.74201731	19.64170649	12.21510852	33.80973187
summer smog	Pt	11.03766808	6.549029212	22.50471766	13.92573933	8.660368554	23.97070302

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	2:58:39 PM		
Project	Thesis_Dredging Limited LCA						

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Single score
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_20k_1.9_Avg	CPD_20k_1.9_High	CPD_20k_1.9_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low
Total	Pt	1353.885671	795.3839395	2780.594463	1408.264091	884.8041061	2406.890161
greenhouse	Pt	82.9996759	48.76084489	170.4637579	86.33333347	54.24272937	147.5538944
acidification	Pt	817.0118278	479.980031	1677.96928	849.8268676	533.9412592	1452.454792
eutrophication	Pt	222.9239527	130.9638883	457.8385915	231.8776277	145.6873597	396.3063353
carcinogens	Pt	198.1234939	116.3940563	406.9037008	206.0810657	129.4795304	352.2169548
winter smog	Pt	19.20827736	11.28452398	39.44973407	19.97977217	12.55317421	34.14779756
summer smog	Pt	13.61844317	8.000595036	27.96939836	14.16542393	8.900053153	24.21038762

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:01:10 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Single score
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	MBD_20k_2.3_Avg	MBD_20k_2.3_High	MBD_20k_2.3_Low
Total	Pt	1610.423113	939.692224	3323.900818	1432.060622	908.6006377	2430.686693
greenhouse	Pt	98.72664979	57.60763388	203.7710396	87.79217484	55.70157073	149.0127358
acidification	Pt	971.8211513	567.0638799	2005.831321	864.1870519	548.3014436	1466.814976
eutrophication	Pt	265.1641078	154.724959	547.2966624	235.795844	149.605576	400.2245516
carcinogens	Pt	235.6643997	137.5116899	486.4094935	209.5633775	132.9618422	355.6992666
winter smog	Pt	22.84790695	13.33190037	47.15790278	20.3173859	12.89078793	34.48541128
summer smog	Pt	16.19889782	9.452160861	33.4343995	14.4047881	9.139417319	24.44975178

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:04:11 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Single score
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low	MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
Total	Pt	2118.401017	1225.919583	4398.440055	1473.696589	950.2366041	2472.32266
greenhouse	Pt	129.8681282	75.15474183	269.6454412	90.34465899	58.25405488	151.5652199
acidification	Pt	1278.363989	739.7897922	2654.269579	889.3125686	573.4269603	1491.940493
eutrophication	Pt	348.8051749	201.8537053	724.2248471	242.6514112	156.4611432	407.0801188
carcinogens	Pt	310.0003345	179.3973274	643.6542834	215.6562576	139.0547223	361.7921467
winter smog	Pt	30.05485262	17.39275618	62.40294758	20.90809692	13.48149895	35.0761223
summer smog	Pt	21.3085377	12.33125996	44.2429573	14.82359528	9.558224501	24.86855896

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	2:26:00 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Single score
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low
Total	Pt	5177.354374	2946.087076	10877.40418	6734.514032	4117.214109	11727.58067
greenhouse	Pt	317.3966195	180.6092477	666.8369726	412.8579643	252.4049438	718.9568632
acidification	Pt	3124.310901	1777.836961	6564.046039	4063.989846	2484.561804	7077.091019
eutrophication	Pt	852.4769311	485.0877664	1791.018244	1108.870948	677.9196082	1931.003995
carcinogens	Pt	757.6382257	431.1213844	1591.766105	985.508214	602.5005374	1716.178336
winter smog	Pt	73.45380851	41.7976635	154.323368	95.54603924	58.4130494	166.3852622
summer smog	Pt	52.07788798	29.63405277	109.4134563	67.74102023	41.41416633	117.9651978

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	2:30:08 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Single score
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_100k_1.9_Avg	CPD_100k_1.9_High	CPD_100k_1.9_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low
Total	Pt	6460.105299	3667.628498	13593.77668	6853.528547	4236.228624	11846.59519
greenhouse	Pt	396.0353947	224.8431926	833.3636165	420.1541241	259.7011036	726.253023
acidification	Pt	3898.395966	2213.256206	8203.260123	4135.809991	2556.38195	7148.911165
eutrophication	Pt	1063.688197	603.8931201	2238.282372	1128.467275	697.5159349	1950.600322
carcinogens	Pt	945.3520781	536.7095523	1989.27176	1002.924435	619.916758	1733.594556
winter smog	Pt	91.65286039	52.03454544	192.8619517	97.23455981	60.10156997	168.0737828
summer smog	Pt	64.98080212	36.89188189	136.7368598	68.93816149	42.61130759	119.162339

SimaPro 7.1 Impact assessment Date: 8/13/2008 Time: 2:33:54 PM
Project Thesis_Dredging Limited LCA

Title: Comparing product stages
Method: Eco-indicator 95 V2.03 / Europe e
Indicator: Single score
Skip categories: With result = 0
Relative mode: Non

Impact category	Unit	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	MBD_100k_2.3_Avg	MBD_100k_2.3_High	MBD_100k_2.3_Low
Total	Pt	7742.824367	4389.16992	16310.18104	6972.543061	4355.243138	11965.6097
greenhouse	Pt	474.6722171	269.0771375	999.8922133	427.4502838	266.9972633	733.5491827
acidification	Pt	4672.461808	2648.675451	9842.49343	4207.630137	2628.202095	7220.73131
eutrophication	Pt	1274.894218	722.6984737	2685.551745	1148.063602	717.1122617	1970.196649
carcinogens	Pt	1133.061269	642.2977202	2386.782076	1020.340655	637.3329785	1751.010777
winter smog	Pt	109.8514603	62.27142737	231.4009875	98.92308038	61.79009054	169.7623034
summer smog	Pt	77.88339583	44.14971102	164.0605838	70.13530275	43.80844885	120.3594803

SimaPro 7.1 Impact assessment Date: 8/13/2008 Time: 2:39:12 PM
Project Thesis_Dredging Limited LCA

Title: Comparing product stages
Method: Eco-indicator 95 V2.03 / Europe e
Indicator: Single score
Skip categories: With result = 0
Relative mode: Non

Impact category	Unit	CPD_100k_3.0_Avg	CPD_100k_3.0_High	CPD_100k_3.0_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
Total	Pt	10278.47702	5815.942425	21678.54479	7180.818461	4563.518539	12173.8851
greenhouse	Pt	630.1198689	356.5451254	1328.998622	440.2185634	279.7655429	746.3174623
acidification	Pt	6202.61923	3509.67135	13082.07028	4333.315392	2753.88735	7346.416565
eutrophication	Pt	1692.401932	957.623603	3569.479312	1182.357174	751.4058335	2004.490221
carcinogens	Pt	1504.120933	851.0872506	3172.372031	1050.819041	667.8113645	1781.489163
winter smog	Pt	145.826078	82.513788	307.564745	101.8779914	64.74500154	172.7172144
summer smog	Pt	103.3889775	58.50130708	218.0597938	72.23029997	45.90344606	122.4544775

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:28:37 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	CPD_1k_1.9_Avg	CPD_1k_1.9_High
	Total		kg SO2	871.9988454	720.4598206	1259.289296	959.2420268	769.3852772
1	Nitric oxide	Air	kg SO2	862.1396092	712.3139572	1245.051169	948.3963775	760.6862391
2	Nitrogen oxides	Air	kg SO2	0.723885208	0.598085892	1.045392318	0.796309672	0.6387011
3	Sulfur oxides	Air	kg SO2	9.135350936	7.547777536	13.19273495	10.04933962	8.060336948

CPD_1k_1.9_Low	CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low	MBD_1k_1.5_Avg
1443.950422	1046.268724	818.5272181	1628.611548	1225.95071	922.6561765	2000.748096	773.4984793
1427.624427	1034.439109	809.2725577	1610.197686	1212.089525	912.2241843	1978.12668	764.7529354
1.19868777	0.868554422	0.679496021	1.351983223	1.017716468	0.765938122	1.660910401	0.642115653
15.12730654	10.96106035	8.575164322	17.06187813	12.84346881	9.666054044	20.9605048	8.103428226

MBD_1k_1.5_High	MBD_1k_1.5_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High	MBD_1k_2.3_Low
595.7648517	1112.945895	781.5083992	603.7747715	1120.955815	789.518319	611.7846914	1128.965735
589.0288492	1100.362396	772.6722913	596.9482051	1108.281752	780.5916472	604.867561	1116.201108
0.494571026	0.923906121	0.648765045	0.501220418	0.930555513	0.655414437	0.507869811	0.937204906
6.241431424	11.65959264	8.18734282	6.325346018	11.74350724	8.271257414	6.409260612	11.82742183

MBD_1k_3.0_Avg	MBD_1k_3.0_High	MBD_1k_3.0_Low
803.8062842	626.0726566	1143.2537
794.7180658	618.9939796	1130.327526
0.667275516	0.519730889	0.949065984
8.420942906	6.558946104	11.97710732

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:34:38 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	CPD_5k_1.9_Avg	CPD_5k_1.9_High
	Total		kg SO2	2258.364438	1500.236345	4195.033174	2694.147376	1745.296597
1	Nitric oxide	Air	kg SO2	2232.830289	1483.273955	4147.602122	2663.686057	1725.563438
2	Nitrogen oxides	Air	kg SO2	1.874769238	1.245413231	3.482484499	2.236532129	1.448848696
3	Sulfur oxides	Air	kg SO2	23.65937958	15.71697666	43.94856764	28.22478709	18.28430964

CPD_5k_1.9_Low	CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low	MBD_5k_1.5_Avg
5118.122319	3129.930314	1990.573332	6040.99498	3998.681895	2482.209226	7872.235852	2591.317324
5060.25438	3094.541825	1968.066958	5972.692601	3953.470884	2454.144181	7783.228587	2562.01865
4.248782049	2.59829502	1.652463875	5.014899884	3.319484528	2.0605928	6.535094764	2.151168307
53.6191576	32.7901946	20.85391059	63.28747961	41.8915261	26.00445229	82.47217017	27.14750514

MBD_5k_1.5_High	MBD_5k_1.5_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High	MBD_5k_2.3_Low
1701.999732	4287.904948	2631.799892	1742.482301	4328.387516	2672.28246	1782.964869	4368.870084
1682.756109	4239.423843	2602.043503	1722.780962	4279.448696	2642.068356	1762.805815	4319.473549
1.412906034	3.559581509	2.184774696	1.446512423	3.593187898	2.218381085	1.480118812	3.626794287
17.83071724	44.92152333	27.57161403	18.25482614	45.34563223	27.99572293	18.67893503	45.76974112

MBD_5k_3.0_Avg	MBD_5k_3.0_High	MBD_5k_3.0_Low
2742.856348	1853.538757	4439.443973
2711.844302	1832.581761	4389.249495
2.276967624	1.538705351	3.685380825
28.73507854	19.41829064	46.50909673

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:31:47 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	CPD_20k_1.9_Avg
	Total		kg SO2	7457.018925	4424.506555	15204.12684	9200.583647
1	Nitric oxide	Air	kg SO2	7372.706301	4374.480967	15032.22171	9096.557446
2	Nitrogen oxides	Air	kg SO2	6.190404638	3.672980607	12.62162511	7.637815627
3	Sulfur oxides	Air	kg SO2	78.12221905	46.35260736	159.2835072	96.388385

CPD_20k_1.9_High	CPD_20k_1.9_Low	CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low
5405.180529	18896.05045	10943.93188	6385.854504	22588.19055	14395.99087	8330.966129	29890.42318
5344.066972	18682.40266	10820.19455	6313.652977	22332.79766	14233.22291	8236.77224	29552.46776
4.487081896	15.68645588	9.085046904	5.301183185	18.75146636	11.95075533	6.915907266	24.81337598
56.62647522	197.9613311	114.652283	66.90034308	236.641423	150.817205	87.27798165	313.1420493

MBD_20k_1.5_Avg	MBD_20k_1.5_High	MBD_20k_1.5_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low	MBD_20k_2.3_Avg
9408.192111	5850.921746	16194.54261	9570.122383	6012.852018	16356.47288	9731.836171
9301.818589	5784.768426	16011.43936	9461.918	5944.867837	16171.53877	9621.803375
7.810160691	4.857111599	13.4438135	7.944586246	4.991537154	13.57823905	8.078832087
98.56336056	61.29620897	169.6594333	100.2597961	62.99264455	171.3558689	101.9539637

MBD_20k_2.3_High	MBD_20k_2.3_Low	MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
6174.565806	16518.18667	10014.78118	6457.510814	16801.13168
6104.753211	16331.42415	9901.549271	6384.499107	16611.17004
5.125782996	13.71248489	8.313717382	5.360668291	13.94737019
64.68681216	173.0500365	104.9181901	67.6510385	176.0142629

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:24:37 PM		
Project	Thesis_Dredging Limited LCA						

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	acidification
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	CPD_100k_1.9_Avg
	Total		kg SO2	35183.68132	20020.6865	73919.43738	43900.85548
1	Nitric oxide	Air	kg SO2	34785.87778	19794.32304	73083.66885	43404.4914
2	Nitrogen oxides	Air	kg SO2	29.2075461	16.62006652	61.36382817	36.44406191
3	Sulfur oxides	Air	kg SO2	368.5959881	209.7433937	774.4046967	459.920014

CPD_100k_1.9_High	CPD_100k_1.9_Low	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	CPD_100k_3.0_Avg	CPD_100k_3.0_High
24924.05637	92379.05544	52617.81315	29827.42625	110838.89	69849.31565	39523.32602
24642.25307	91334.57364	52022.89098	29490.18309	109585.6925	69059.56587	39076.45638
20.69057296	76.68798202	43.680398	24.76107941	92.01231558	57.98503825	32.81007909
261.112733	967.7938165	551.2417719	312.4820723	1161.185204	731.7647432	414.0595544

CPD_100k_3.0_Low	MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low
147320.6113	45765.65142	27979.2996	79696.97094	46574.43684	28788.08502	80505.75636
145654.934	45248.20307	27662.95225	78795.87885	46047.84397	28462.59316	79595.51976
122.2974227	37.99211235	23.22686689	66.16001696	38.66352127	23.89827581	66.83142588
1543.379892	479.4562386	293.1204807	834.9320666	487.9293447	301.5935868	843.4051726

MBD_100k_2.3_Avg	MBD_100k_2.3_High	MBD_100k_2.3_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
47383.22226	29596.87044	81314.54178	48798.59676	31012.24493	82729.91628
46847.48488	29262.23407	80395.16067	48246.85647	30661.60566	81794.53226
39.33493019	24.56968474	67.5028348	40.50989581	25.74465035	68.67780042
496.4024507	310.0666928	851.8782787	511.2303863	324.8946283	866.7062142

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:29:00 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	CPD_1k_1.9_Avg
	Total		kg B(a)P	0.020410267	0.016863299	0.029475303	0.022452307
1	Benzene	Air	kg B(a)P	1.03705E-05	8.56824E-06	1.49764E-05	1.1408E-05
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.020399896	0.016854731	0.029460327	0.022440899

CPD_1k_1.9_High	CPD_1k_1.9_Low	CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low
0.018008463	0.033797537	0.02448928	0.019158694	0.038119771	0.02869497	0.021595968	0.046830111
9.15009E-06	1.71725E-05	1.2443E-05	9.73453E-06	1.93686E-05	1.45799E-05	1.09729E-05	2.37944E-05
0.017999313	0.033780365	0.024476837	0.019148959	0.038100402	0.028680391	0.021584995	0.046806316

MBD_1k_1.5_Avg	MBD_1k_1.5_High	MBD_1k_1.5_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High
0.018104738	0.013944651	0.026049946	0.01829222	0.014132134	0.026237428	0.018479703	0.014319616
9.19901E-06	7.08527E-06	1.3236E-05	9.29427E-06	7.18053E-06	1.33312E-05	9.38953E-06	7.27579E-06
0.018095539	0.013937566	0.02603671	0.018282926	0.014124953	0.026224097	0.018470313	0.01431234

MBD_1k_2.3_Low	MBD_1k_3.0_Avg	MBD_1k_3.0_High	MBD_1k_3.0_Low
0.026424911	0.018814131	0.014654045	0.026759339
1.34265E-05	9.55945E-06	7.44572E-06	1.35964E-05
0.026411485	0.018804572	0.014646599	0.026745743

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:35:16 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	CPD_5k_1.9_Avg
	Total		kg B(a)P	0.052859956	0.035114982	0.098190206	0.063060023
1	Benzene	Air	kg B(a)P	2.68581E-05	1.78419E-05	4.98904E-05	3.20408E-05
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.052833098	0.035097141	0.098140316	0.063027982

CPD_5k_1.9_High	CPD_5k_1.9_Low	CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low
0.040850936	0.119796308	0.073260089	0.046591957	0.141397343	0.093594349	0.058099335	0.184259916
2.07563E-05	6.08685E-05	3.72234E-05	2.36734E-05	7.18439E-05	4.75553E-05	2.95203E-05	9.36224E-05
0.04083018	0.11973544	0.073222865	0.046568284	0.141325499	0.093546794	0.058069814	0.184166294

MBD_5k_1.5_Avg	MBD_5k_1.5_High	MBD_5k_1.5_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High
0.060653151	0.039837517	0.100363991	0.061600699	0.040785064	0.101311538	0.062548246	0.041732611
3.08178E-05	2.02414E-05	5.09949E-05	3.12993E-05	2.07229E-05	5.14764E-05	3.17807E-05	2.12043E-05
0.060622334	0.039817275	0.100312996	0.061569399	0.040764341	0.101260062	0.062516465	0.041711407

MBD_5k_2.3_Low	MBD_5k_3.0_Avg	MBD_5k_3.0_High	MBD_5k_3.0_Low
0.102259085	0.064200119	0.043384485	0.103910959
5.19578E-05	3.26201E-05	2.20436E-05	5.27971E-05
0.102207127	0.064167499	0.043362441	0.103858162

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:32:13 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	CPD_20k_1.9_Avg
	Total		kg B(a)P	0.174541224	0.103561329	0.355872359	0.215351624
1	Benzene	Air	kg B(a)P	8.86843E-05	5.26195E-05	0.000180819	0.00010942
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.17445254	0.10350871	0.35569154	0.215242204

CPD_20k_1.9_High	CPD_20k_1.9_Low	CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low
0.126515279	0.442286631	0.256156956	0.149469228	0.528705971	0.336956885	0.194997095	0.699624221
6.42824E-05	0.000224726	0.000130153	7.59453E-05	0.000268635	0.000171208	9.9078E-05	0.000355479
0.126450996	0.442061906	0.256026803	0.149393283	0.528437336	0.336785678	0.194898017	0.699268742

MBD_20k_1.5_Avg	MBD_20k_1.5_High	MBD_20k_1.5_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low	MBD_20k_2.3_Avg
0.22021097	0.136948431	0.379054328	0.224001158	0.14073862	0.382844516	0.22778628
0.000111889	6.95835E-05	0.000192597	0.000113815	7.15093E-05	0.000194523	0.000115738
0.220099081	0.136878848	0.37886173	0.223887343	0.140667111	0.382649993	0.227670542

MBD_20k_2.3_High	MBD_20k_2.3_Low	MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
0.144523741	0.386629638	0.234408976	0.151146437	0.393252333
7.34325E-05	0.000196446	0.000119103	7.67975E-05	0.000199811
0.144450309	0.386433191	0.234289873	0.15106964	0.393052522

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:25:19 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	carcinogens
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	CPD_100k_1.9_Avg
	Total		kg B(a)P	0.823519811	0.4686102	1.730180549	1.027556607
1	Benzene	Air	kg B(a)P	0.00041843	0.000238101	0.000879104	0.000522101
2	PAH, polycyclic aromatic hydrocarbons	Air	kg B(a)P	0.82310138	0.4683721	1.729301445	1.027034505

CPD_100k_1.9_High	CPD_100k_1.9_Low	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	CPD_100k_3.0_Avg	CPD_100k_3.0_High
0.583379948	2.162251913	1.231588336	0.698149696	2.594328344	1.634914058	0.925094838
0.000296415	0.00109864	0.00062577	0.00035473	0.001318177	0.000830699	0.00047004
0.583083533	2.161153273	1.230962566	0.697794966	2.593010166	1.634083359	0.924624797

CPD_100k_3.0_Low	MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low
3.448230468	1.07120458	0.654891889	1.865411235	1.090135255	0.673822563	1.884341909
0.001752045	0.000544279	0.00033275	0.000947815	0.000553897	0.000342369	0.000957434
3.446478423	1.070660302	0.654559138	1.86446342	1.089581358	0.673480194	1.883384476

MBD_100k_2.3_Avg	MBD_100k_2.3_High	MBD_100k_2.3_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
1.109065929	0.692753238	1.903272584	1.14219461	0.725881918	1.936401264
0.000563516	0.000351988	0.000967052	0.000580349	0.00036882	0.000983885
1.108502413	0.69240125	1.902305532	1.141614261	0.725513098	1.935417379

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:28:47 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	CPD_1k_1.9_Avg	CPD_1k_1.9_High
	Total		kg PO4	161.2820263	133.2538688	232.9139889	177.418237	142.3029597
1	Nitric oxide	Air	kg PO4	161.1475905	133.1427957	232.7198446	177.2703509	142.1843438
2	Nitrogen oxides	Air	kg PO4	0.134435824	0.111073094	0.194144288	0.147886082	0.118615919

CPD_1k_1.9_Low	CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low	MBD_1k_1.5_Avg
267.0683008	193.5144075	151.3920908	301.2226127	226.7477942	170.651439	370.0517595	143.063724
266.8456874	193.3531045	151.2658986	300.9715301	226.5587897	170.5091933	369.7433047	142.9444739
0.222613443	0.161302964	0.126192118	0.251082599	0.189004487	0.142245651	0.308454789	0.11925005

MBD_1k_1.5_High	MBD_1k_1.5_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High	MBD_1k_2.3_Low
110.1906992	205.8467968	144.5452123	111.6721875	207.3282851	146.0267006	113.1536759	208.8097734
110.0988503	205.6752142	144.4247273	111.5791038	207.1554676	145.9049808	113.0593572	208.6357211
0.091848905	0.171582565	0.120484937	0.093083792	0.172817452	0.121719824	0.094318679	0.17405234

MBD_1k_3.0_Avg	MBD_1k_3.0_High	MBD_1k_3.0_Low
148.6693555	115.7963307	211.4524283
148.5454329	115.6998093	211.2761732
0.123922596	0.096521451	0.176255111

SimaPro 7.1	Inventory	Date:	8/13/2008	Time: 3:34:53 PM
Project	Thesis_Dredging Limited LCA			

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	CPD_5k_1.9_Avg	CPD_5k_1.9_High
	Total		kg PO4	417.6996273	277.4787593	775.8994802	498.3006002	322.804294
1	Nitric oxide	Air	kg PO4	417.3514559	277.2474683	775.2527331	497.8852443	322.5352221
2	Nitrogen oxides	Air	kg PO4	0.34817143	0.231291029	0.646747121	0.415355967	0.269071901

CPD_5k_1.9_Low	CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low	MBD_5k_1.5_Avg
946.6309997	578.9015732	368.169869	1117.322479	739.5829961	459.10122	1456.022742	479.2814934
945.8419401	578.4190327	367.8629828	1116.39114	738.9665204	458.7185384	1454.809082	478.8819907
0.789059523	0.482540504	0.306886148	0.93133855	0.616475698	0.38268152	1.213660456	0.399502686

MBD_5k_1.5_High	MBD_5k_1.5_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High	MBD_5k_2.3_Low
314.796249	793.0767367	486.7690154	322.2837711	800.5642588	494.2565375	329.7712932	808.0517809
314.5338522	792.4156716	486.3632716	322.0151331	799.8969525	493.8445525	329.496414	807.3782334
0.262396835	0.661065137	0.405743872	0.268638021	0.667306324	0.411985059	0.274879208	0.67354751

MBD_5k_3.0_Avg	MBD_5k_3.0_High	MBD_5k_3.0_Low
507.3096509	342.8244065	821.1048943
506.8867854	342.538647	820.4204664
0.422865416	0.285759565	0.684427868

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:31:58 PM		
Project	Thesis_Dredging Limited LCA						

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	CPD_20k_1.9_Avg
	Total		kg PO4	1379.225591	818.3421187	2812.105083	1701.709563
1	Nitric oxide	Air	kg PO4	1378.075944	817.6599938	2809.761067	1700.291111
2	Nitrogen oxides	Air	kg PO4	1.149646576	0.68212497	2.344016092	1.418451474

CPD_20k_1.9_High	CPD_20k_1.9_Low	CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low
999.724338	3494.95108	2024.153495	1181.106557	4177.837118	2662.634923	1540.867979	5528.433947
998.8910228	3492.037881	2022.466272	1180.122052	4174.354702	2660.415497	1539.583596	5523.825749
0.833315209	2.913198949	1.687222996	0.984505449	3.482415181	2.219425989	1.284382778	4.608198397

MBD_20k_1.5_Avg	MBD_20k_1.5_High	MBD_20k_1.5_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low	MBD_20k_2.3_Avg
1740.108139	1082.167161	2995.289112	1770.058227	1112.11725	3025.239201	1799.968275
1738.65768	1081.265126	2992.792404	1768.582804	1111.19025	3022.717528	1798.467921
1.450458414	0.902035011	2.496708221	1.47542316	0.926999757	2.521672967	1.500354531

MBD_20k_2.3_High	MBD_20k_2.3_Low	MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
1142.027298	3055.149249	1852.300849	1194.359872	3107.481823
1141.075367	3052.602644	1850.756873	1193.364319	3104.891597
0.951931128	2.546604337	1.543976085	0.995552683	2.590225892

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:24:59 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	eutrophication
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	CPD_100k_1.9_Avg
	Total		kg PO4	6507.457489	3702.960049	13671.89499	8119.75723
1	Nitric oxide	Air	kg PO4	6502.033231	3699.873465	13660.49885	8112.989047
2	Nitrogen oxides	Air	kg PO4	5.424258561	3.086583782	11.39613952	6.768182926

CPD_100k_1.9_High	CPD_100k_1.9_Low	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	CPD_100k_3.0_Avg	CPD_100k_3.0_High
4609.871145	17086.12498	9732.01693	5516.782242	20500.395	12919.09872	7310.10384
4606.028611	17071.88292	9723.904856	5512.183756	20483.307	12908.33007	7304.010539
3.842534979	14.2420538	8.112073915	4.598486176	17.08800146	10.76864996	6.093300402

CPD_100k_3.0_Low	MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low
27247.93368	8464.663728	5174.958841	14740.48852	8614.254008	5324.549122	14890.0788
27225.2213	8457.60805	5170.64528	14728.20165	8607.07364	5320.11087	14877.66725
22.7123785	7.055678008	4.313560994	12.28686029	7.180368236	4.438251223	12.41155052

MBD_100k_2.3_Avg	MBD_100k_2.3_High	MBD_100k_2.3_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
8763.844289	5474.139402	15039.66908	9025.62728	5735.922393	15301.45207
8756.539231	5469.576461	15027.13284	9018.104014	5731.141244	15288.69762
7.305058465	4.562941451	12.53624075	7.523266364	4.781149351	12.75444865

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:28:25 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	CPD_1k_1.9_Avg
	Total		kg CO2	41131.58872	33983.59664	59399.81419	45246.78987
1	Carbon dioxide, fossil	Air	kg CO2	41109.07921	33964.99891	59367.30729	45222.0283
2	Methane	Air	kg CO2	22.50950471	18.59772385	32.50689893	24.76157283

CPD_1k_1.9_High	CPD_1k_1.9_Low	CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low
36291.37694	68110.15311	49351.77961	38609.36865	76820.49203	57827.25593	43521.06036	94373.9183
36271.51627	68072.87943	49324.77156	38588.23945	76778.45157	57795.60963	43497.2432	94322.27162
19.86067024	37.27368331	27.00805269	21.12920489	42.0404677	31.64630714	23.81715716	51.64668384

MBD_1k_1.5_Avg	MBD_1k_1.5_High	MBD_1k_1.5_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High
36485.39386	28101.8203	52496.89613	36863.2163	28479.64273	52874.71856	37241.03874	28857.46517
36465.42702	28086.44141	52468.16689	36843.04269	28464.05708	52845.78256	37220.65836	28841.67275
19.96684715	15.37888703	28.72923627	20.17361271	15.58565259	28.93600183	20.38037827	15.79241815

MBD_1k_2.3_Low	MBD_1k_3.0_Avg	MBD_1k_3.0_High	MBD_1k_3.0_Low
53252.541	37914.99228	29531.41871	53926.49454
53223.39824	37894.24308	29515.25747	53896.98295
29.14276739	20.74920332	16.1612432	29.51159244

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:34:27 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	CPD_5k_1.9_Avg
	Total		kg CO2	106525.5048	70765.1216	197876.8436	127081.0878
1	Carbon dioxide, fossil	Air	kg CO2	106467.2081	70726.39497	197768.5544	127011.5419
2	Methane	Air	kg CO2	58.29671129	38.72663049	108.2892707	69.54587539

CPD_5k_1.9_High	CPD_5k_1.9_Low	CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low
82324.44594	241418.3268	147636.6707	93893.98169	284949.5986	188615.0882	117084.1103	371327.9772
82279.3934	241286.2092	147555.8757	93842.59766	284793.6582	188511.8675	117020.0353	371124.7658
45.05253896	132.1176043	80.79503948	51.38403569	155.9403498	103.2207203	64.07497045	203.2114273

MBD_5k_1.5_Avg	MBD_5k_1.5_High	MBD_5k_1.5_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High
122230.6646	80282.16249	202257.5416	124140.1996	82191.69751	204167.0767	126049.7346	84101.23254
122163.7731	80238.2276	202146.855	124072.2632	82146.71762	204055.345	125980.7532	84055.20764
66.89145266	43.93488729	110.6866335	67.93645698	44.9798916	111.7316378	68.98146129	46.02489592

MBD_5k_2.3_Low	MBD_5k_3.0_Avg	MBD_5k_3.0_High	MBD_5k_3.0_Low
206076.6117	129378.6567	87430.15457	209405.5337
205963.835	129307.8534	87382.3079	209290.9353
112.7766421	70.80323352	47.84666815	114.5984144

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:31:35 PM		
Project	Thesis_Dredging Limited LCA						

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	CPD_20k_1.9_Avg
	Total		kg CO2	351742.4789	208700.9459	717168.2569	433985.2335
1	Carbon dioxide, fossil	Air	kg CO2	351549.9857	208586.7331	716775.7823	433747.7325
2	Methane	Air	kg CO2	192.4931477	114.2128245	392.4745617	237.5009806

CPD_20k_1.9_High	CPD_20k_1.9_Low	CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low
254958.6661	891313.7668	516217.7767	301216.3863	1065469.488	679049.0363	392965.9704	1409910.804
254819.1385	890825.9901	515935.2734	301051.5438	1064886.404	678677.4227	392750.9174	1409139.222
139.5276349	487.7767199	282.5032253	164.8424453	583.0844664	371.6135932	215.0529468	771.5820094

MBD_20k_1.5_Avg	MBD_20k_1.5_High	MBD_20k_1.5_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low	MBD_20k_2.3_Avg
443777.9826	275983.9742	763885.4908	451416.1227	283622.1144	771523.631	459044.0514
443535.1225	275832.9404	763467.45	451169.0826	283466.9005	771101.4101	458792.8369
242.8601204	151.0338589	418.0408437	247.0401377	155.2138762	422.220861	251.2145667

MBD_20k_2.3_High	MBD_20k_2.3_Low	MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
291250.043	779151.5596	472390.3738	304596.3654	792497.882
291090.6547	778725.1644	472131.8554	304429.6732	792064.1829
159.3883052	426.39529	258.5184204	166.6921589	433.6991437

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:24:17 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	greenhouse
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	CPD_100k_1.9_Avg
	Total		kg CO2	1659590.167	944362.0795	3486729.269	2070773.306
1	Carbon dioxide, fossil	Air	kg CO2	1658681.947	943845.2717	3484821.135	2069640.063
2	Methane	Air	kg CO2	908.2205147	516.8077221	1908.133173	1133.242914

CPD_100k_1.9_High	CPD_100k_1.9_Low	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	CPD_100k_3.0_Avg	CPD_100k_3.0_High
1175650.68	4357456.818	2481946.233	1406939.281	5228194.579	3294744.413	1864288.237
1175007.299	4355072.174	2480587.973	1406169.325	5225333.419	3292941.344	1863267.995
643.3817742	2384.643964	1358.259726	769.9558262	2861.160343	1803.068327	1020.242742

CPD_100k_3.0_Low	MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low
6949012.404	2158734.454	1319764.412	3759251.572	2196884.309	1357914.267	3797401.427
6945209.516	2157553.074	1319042.163	3757194.3	2195682.051	1357171.14	3795323.277
3802.888055	1181.380172	722.2488645	2057.272612	1202.257905	743.1265978	2078.150345

MBD_100k_2.3_Avg	MBD_100k_2.3_High	MBD_100k_2.3_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
2235034.164	1396064.122	3835551.282	2301796.41	1462826.368	3902313.528
2233811.028	1395300.118	3833452.254	2300536.738	1462025.828	3900177.964
1223.135639	764.004331	2099.028079	1259.671672	800.5403642	2135.564112

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:27:29 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	CPD_1k_1.9_Avg	CPD_1k_1.9_High	CPD_1k_1.9_Low
greenhouse	kg CO2	41131.58872	33983.59664	59399.81419	45246.78987	36291.37694	68110.15311
acidification	kg SO2	871.9988454	720.4598206	1259.289296	959.2420268	769.3852772	1443.950422
eutrophication	kg PO4	161.2820263	133.2538688	232.9139889	177.418237	142.3029597	267.0683008
carcinogens	kg B(a)P	0.020410267	0.016863299	0.029475303	0.022452307	0.018008463	0.033797537
winter smog	kg SPM	34.34891952	28.37964354	49.60468343	37.78551698	30.30686692	56.87867259
summer smog	kg C2H4	9.252386942	7.644474614	13.36175145	10.17808504	8.163600594	15.32110747

CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low	MBD_1k_1.5_Avg	MBD_1k_1.5_High
49351.77961	38609.36865	76820.49203	57827.25593	43521.06036	94373.9183	36485.39386	28101.8203
1046.268724	818.5272181	1628.611548	1225.95071	922.6561765	2000.748096	773.4984793	595.7648517
193.5144075	151.3920908	301.2226127	226.7477942	170.651439	370.0517595	143.063724	110.1906992
0.02448928	0.019158694	0.038119771	0.02869497	0.021595968	0.046830111	0.018104738	0.013944651
41.2135869	32.24261785	64.15266175	48.29144271	36.34436321	78.81149806	30.46889013	23.46778215
11.10148612	8.685023592	17.2804635	13.00801074	9.789889064	21.22903677	8.207243929	6.321392469

MBD_1k_1.5_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High	MBD_1k_2.3_Low	MBD_1k_3.0_Avg
52496.89613	36863.2163	28479.64273	52874.71856	37241.03874	28857.46517	53252.541	37914.99228
1112.945895	781.5083992	603.7747715	1120.955815	789.518319	611.7846914	1128.965735	803.8062842
205.8467968	144.5452123	111.6721875	207.3282851	146.0267006	113.1536759	208.8097734	148.6693555
0.026049946	0.01829222	0.014132134	0.026237428	0.018479703	0.014319616	0.026424911	0.018814131
43.84006833	30.784409	23.78330103	44.15558721	31.09992788	24.0988199	44.47110608	31.66274533
11.80896754	8.292233581	6.406382121	11.8939572	8.377223232	6.491371772	11.97894685	8.528826395

MBD_1k_3.0_High	MBD_1k_3.0_Low
29531.41871	53926.49454
626.0726566	1143.2537
115.7963307	211.4524283
0.014654045	0.026759339
24.66163735	45.03392353
6.642974935	12.13055001

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:33:26 PM		
Project	Thesis_Dredging Limited LCA						

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	CPD_5k_1.9_Avg	CPD_5k_1.9_High	CPD_5k_1.9_Low
greenhouse	kg CO2	106525.5048	70765.1216	197876.8436	127081.0878	82324.44594	241418.3268
acidification	kg SO2	2258.364438	1500.236345	4195.033174	2694.147376	1745.296597	5118.122319
eutrophication	kg PO4	417.6996273	277.4787593	775.8994802	498.3006002	322.804294	946.6309997
carcinogens	kg B(a)P	0.052859956	0.035114982	0.098190206	0.063060023	0.040850936	0.119796308
winter smog	kg SPM	88.95926724	59.09583224	165.2466143	106.1251995	68.74900426	201.6080326
summer smog	kg C2H4	23.96248773	15.91833205	44.51160729	28.58638419	18.51855599	54.30609039

CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low	MBD_5k_1.5_Avg	MBD_5k_1.5_High
147636.6707	93893.98169	284949.5986	188615.0882	117084.1103	371327.9772	122230.6646	80282.16249
3129.930314	1990.573332	6040.99498	3998.681895	2482.209226	7872.235852	2591.317324	1701.999732
578.9015732	368.169869	1117.322479	739.5829961	459.10122	1456.022742	479.2814934	314.796249
0.073260089	0.046591957	0.141397343	0.093594349	0.058099335	0.184259916	0.060653151	0.039837517
123.2911317	78.41070382	237.9609233	157.5121381	97.77674062	310.0953598	102.0746193	67.04349684
33.21028064	21.12107695	64.09827647	42.42821232	26.33760394	83.52874845	27.49530082	18.05915247

MBD_5k_1.5_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High	MBD_5k_2.3_Low	MBD_5k_3.0_Avg
202257.5416	124140.1996	82191.69751	204167.0767	126049.7346	84101.23254	206076.6117	129378.6567
4287.904948	2631.799892	1742.482301	4328.387516	2672.28246	1782.964869	4368.870084	2742.856348
793.0767367	486.7690154	322.2837711	800.5642588	494.2565375	329.7712932	808.0517809	507.3096509
0.100363991	0.061600699	0.040785064	0.101311538	0.062548246	0.041732611	0.102259085	0.064200119
168.9049277	103.6692688	68.63814628	170.4995772	105.2639182	70.23279572	172.0942266	108.0438953
45.49702785	27.92484311	18.48869476	45.92657014	28.35438541	18.91823706	46.35611243	29.10321315

MBD_5k_3.0_High	MBD_5k_3.0_Low
87430.15457	209405.5337
1853.538757	4439.443973
342.8244065	821.1048943
0.043384485	0.103910959
73.01277282	174.8742037
19.6670648	47.10494018

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:30:29 PM	
Project	Thesis_Dredging Limited LCA					

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Characterization
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	CPD_20k_1.9_Avg	CPD_20k_1.9_High	CPD_20k_1.9_Low
greenhouse	kg CO2	351742.4789	208700.9459	717168.2569	433985.2335	254958.6661	891313.7668
acidification	kg SO2	7457.018925	4424.506555	15204.12684	9200.583647	5405.180529	18896.05045
eutrophication	kg PO4	1379.225591	818.3421187	2812.105083	1701.709563	999.724338	3494.95108
carcinogens	kg B(a)P	0.174541224	0.103561329	0.355872359	0.215351624	0.126515279	0.442286631
winter smog	kg SPM	293.7395436	174.2858037	598.905987	362.4203276	212.9155468	744.3346051
summer smog	kg C2H4	79.12306867	46.94644596	161.3241409	97.62324852	57.35193574	200.4974793

CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low	MBD_20k_1.5_Avg	MBD_20k_1.5_High
516217.7767	301216.3863	1065469.488	679049.0363	392965.9704	1409910.804	443777.9826	275983.9742
10943.93188	6385.854504	22588.19055	14395.99087	8330.966129	29890.42318	9408.192111	5850.921746
2024.153495	1181.106557	4177.837118	2662.634923	1540.867979	5528.433947	1740.108139	1082.167161
0.256156956	0.149469228	0.528705971	0.336956885	0.194997095	0.699624221	0.22021097	0.136948431
431.092584	251.54529	889.7717506	567.0726909	328.165211	1177.414105	370.5982357	230.4737457
116.1211314	67.75742553	239.6731147	152.7493742	88.39612878	317.1538158	99.82608841	62.08149501

MBD_20k_1.5_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low	MBD_20k_2.3_Avg	MBD_20k_2.3_High	MBD_20k_2.3_Low
763885.4908	451416.1227	283622.1144	771523.631	459044.0514	291250.043	779151.5596
16194.54261	9570.122383	6012.852018	16356.47288	9731.836171	6174.565806	16518.18667
2995.289112	1770.058227	1112.11725	3025.239201	1799.968275	1142.027298	3055.149249
0.379054328	0.224001158	0.14073862	0.382844516	0.22778628	0.144523741	0.386629638
637.9194693	376.9768335	236.8523435	644.2980671	383.3469037	243.2224137	650.6681373
171.8329965	101.5442576	63.79966418	173.5511657	103.2601297	65.51553634	175.2670379

MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
472390.3738	304596.3654	792497.882
10014.78118	6457.510814	16801.13168
1852.300849	1194.359872	3107.481823
0.234408976	0.151146437	0.393252333
394.4923947	254.3679048	661.8136283
106.2623318	68.51773836	178.2692399

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:21:44 PM	
Project	Thesis_Dredging Limited LCA					
Title:	Comparing product stages					
Method:	Eco-indicator 95 V2.03 / Europe e					
Indicator:	Characterization					
Skip categories:	With result = 0					
Relative mode:	Non					
Impact category	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	CPD_100k_1.9_Avg	CPD_100k_1.9_High
greenhouse	kg CO2	1659590.167	944362.0795	3486729.269	2070773.306	1175650.68
acidification	kg SO2	35183.68132	20020.6865	73919.43738	43900.85548	24924.05637
eutrophication	kg PO4	6507.457489	3702.960049	13671.89499	8119.75723	4609.871145
carcinogens	kg B(a)P	0.823519811	0.4686102	1.730180549	1.027556607	0.583379948
winter smog	kg SPM	1385.920915	788.6351604	2911.76166	1729.299253	981.7838762
summer smog	kg C2H4	373.3181934	212.4304858	784.3258518	465.8122016	264.4579347

CPD_100k_1.9_Low	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	CPD_100k_3.0_Avg	CPD_100k_3.0_High	CPD_100k_3.0_Low
4357456.818	2481946.233	1406939.281	5228194.579	3294744.413	1864288.237	6949012.404
92379.05544	52617.81315	29827.42625	110838.89	69849.31565	39523.32602	147320.6113
17086.12498	9732.01693	5516.782242	20500.395	12919.09872	7310.10384	27247.93368
2.162251913	1.231588336	0.698149696	2.594328344	1.634914058	0.925094838	3.448230468
3638.90475	2072.669062	1174.932592	4366.056368	2751.435434	1556.863924	5803.108396
980.1925436	558.3039128	316.4853836	1176.061532	741.1396237	419.3642085	1563.152643

MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low	MBD_100k_2.3_Avg
2158734.454	1319764.412	3759251.572	2196884.309	1357914.267	3797401.427	2235034.164
45765.65142	27979.2996	79696.97094	46574.43684	28788.08502	80505.75636	47383.22226
8464.663728	5174.958841	14740.48852	8614.254008	5324.549122	14890.0788	8763.844289
1.07120458	0.654891889	1.865411235	1.090135255	0.673822563	1.884341909	1.109065929
1802.755457	1102.133008	3139.34457	1834.614336	1133.991886	3171.203449	1866.473215
485.5987113	296.8757443	845.6286578	494.1803691	305.4574021	854.2103156	502.7620269

MBD_100k_2.3_High	MBD_100k_2.3_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
1396064.122	3835551.282	2301796.41	1462826.368	3902313.528
29596.87044	81314.54178	48798.59676	31012.24493	82729.91628
5474.139402	15039.66908	9025.62728	5735.922393	15301.45207
0.692753238	1.903272584	1.14219461	0.725881918	1.936401264
1165.850765	3203.062328	1922.226252	1221.603803	3258.815365
314.0390599	862.7919734	517.7799281	329.056961	877.8098746

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:29:29 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	CPD_1k_1.9_Avg
	Total		kg C2H4	9.252386942	7.644474614	13.36175145	10.17808504
1	Acetaldehyde	Air	kg C2H4	0.102063795	0.08432679	0.147394512	0.112275242
2	Acrolein	Air	kg C2H4	0.014102059	0.011651353	0.020365361	0.015512965
3	Benzene	Air	kg C2H4	0.044545798	0.036804473	0.064330414	0.04900259
4	Formaldehyde	Air	kg C2H4	0.126148234	0.10422575	0.182175838	0.138769321
5	Methane	Air	kg C2H4	0.01432423	0.011834915	0.020686208	0.015757365
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.002099589	0.001734715	0.003032102	0.002309652
7	Propene	Air	kg C2H4	0.673713861	0.556633498	0.972937817	0.741118698
8	Toluene	Air	kg C2H4	0.058323917	0.048188182	0.084227961	0.064159205
9	VOC, volatile organic compounds	Air	kg C2H4	8.21706546	6.789074938	11.86660124	9.039180003

CPD_1k_1.9_High	CPD_1k_1.9_Low	CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low
8.163600594	15.32110747	11.10148612	8.685023592	17.2804635	13.00801074	9.789889064	21.22903677
0.090053309	0.16900832	0.122461351	0.095805166	0.190622127	0.143492371	0.107993022	0.234179144
0.012442581	0.023351721	0.01692037	0.01323731	0.02633808	0.019826206	0.014921294	0.032356312
0.039303815	0.073763772	0.053448322	0.041814216	0.08319713	0.062627323	0.047133613	0.102207614
0.111303581	0.208889951	0.15135909	0.118412729	0.235604063	0.177352892	0.133476607	0.289439419
0.012638608	0.023719617	0.017186943	0.013445858	0.026753025	0.020138559	0.015156373	0.032866072
0.001852517	0.003476727	0.002519194	0.00197084	0.003921352	0.00295183	0.002221561	0.004817378
0.594433729	1.115608603	0.808356278	0.632401218	1.258279388	0.947180138	0.712852154	1.545795308
0.051460576	0.096579078	0.069980013	0.054747451	0.108930196	0.081998099	0.061712149	0.133820666
7.250111878	13.60670969	9.85925456	7.713188804	15.34681814	11.55244332	8.694422292	18.85355486

MBD_1k_1.5_Avg	MBD_1k_1.5_High	MBD_1k_1.5_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High
8.207243929	6.321392469	11.80896754	8.292233581	6.406382121	11.8939572	8.377223232	6.491371772
0.090534742	0.069731768	0.130265633	0.091472269	0.070669296	0.13120316	0.092409796	0.071606823
0.0125091	0.009634773	0.01799868	0.012638637	0.00976431	0.018128217	0.012768175	0.009893847
0.039513937	0.030434468	0.056854506	0.039923121	0.030843652	0.05726369	0.040332305	0.031252837
0.11189862	0.086186678	0.161004983	0.11305738	0.087345438	0.162163743	0.114216139	0.088504198
0.012706175	0.009786564	0.018282241	0.012837754	0.009918143	0.018413819	0.012969332	0.010049721
0.001862421	0.001434476	0.002679738	0.001881707	0.001453762	0.002699024	0.001900993	0.001473048
0.597611625	0.460293085	0.859871638	0.603800158	0.466481618	0.866060172	0.609988692	0.472670152
0.051735689	0.03984792	0.074439736	0.052271435	0.040383666	0.074975482	0.052807181	0.040919412
7.288871621	5.614042737	10.48757039	7.36435112	5.689522236	10.56304989	7.439830619	5.765001735

MBD_1k_2.3_Low	MBD_1k_3.0_Avg	MBD_1k_3.0_High	MBD_1k_3.0_Low
11.97894685	8.528826395	6.642974935	12.13055001
0.132140688	0.094082143	0.073279169	0.133813034
0.018257755	0.012999241	0.010124914	0.018488821
0.057672874	0.041062202	0.031982733	0.058402771
0.163322503	0.116283116	0.090571175	0.16538948
0.018545397	0.013204038	0.010284427	0.018780104
0.002718311	0.001935395	0.00150745	0.002752713
0.872248705	0.621027697	0.483709157	0.883287711
0.075511228	0.053762836	0.041875067	0.076466884
10.63852939	7.574469725	5.899640842	10.77316849

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:35:43 PM		
Project	Thesis_Dredging Limited LCA						

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	CPD_5k_1.9_Avg
	Total		kg C2H4	23.96248773	15.91833205	44.51160729	28.58638419
1	Acetaldehyde	Air	kg C2H4	0.264332052	0.17559635	0.491010977	0.315338611
2	Acrolein	Air	kg C2H4	0.036522511	0.024261983	0.067842525	0.043570039
3	Benzene	Air	kg C2H4	0.115367867	0.076639122	0.214302006	0.137629707
4	Formaldehyde	Air	kg C2H4	0.326707641	0.217032587	0.606876981	0.38975044
5	Methane	Air	kg C2H4	0.037097907	0.024644219	0.068911354	0.044256466
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.005437664	0.003612252	0.010100752	0.006486937
7	Propene	Air	kg C2H4	1.744831926	1.159095595	3.241118966	2.081521598
8	Toluene	Air	kg C2H4	0.151051416	0.10034378	0.280586114	0.180198895
9	VOC, volatile organic compounds	Air	kg C2H4	21.28113875	14.13710617	39.53085762	25.38763149

CPD_5k_1.9_High	CPD_5k_1.9_Low	CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low
18.51855599	54.30609039	33.21028064	21.12107695	64.09827647	42.42821232	26.33760394	83.52874845
0.204279621	0.599054676	0.36634517	0.232988231	0.707073037	0.468028886	0.290532143	0.921412074
0.028225123	0.082770821	0.050617568	0.032191765	0.097695617	0.064667111	0.040142553	0.12731064
0.089157951	0.261457736	0.159891547	0.101687839	0.308602408	0.20427146	0.12680291	0.402150796
0.252484375	0.740416224	0.452793239	0.287967481	0.873924148	0.578471706	0.359090281	1.138841703
0.028669798	0.084074839	0.051415025	0.032698932	0.099234768	0.065685913	0.040774981	0.129316363
0.004202305	0.012323355	0.00753621	0.004792879	0.014545437	0.00962798	0.005976634	0.018954678
1.348431268	3.954305635	2.418211271	1.537934198	4.667325046	3.089416267	1.917776348	6.082157606
0.116734712	0.342327222	0.209346374	0.133140124	0.404053851	0.267453097	0.166023345	0.526536973
16.44637084	48.22935988	29.49412424	18.7576755	56.92582216	37.6805899	23.39048475	74.18206762

MBD_5k_1.5_Avg	MBD_5k_1.5_High	MBD_5k_1.5_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High
27.49530082	18.05915247	45.49702785	27.92484311	18.48869476	45.92657014	28.35438541	18.91823706
0.303302786	0.199211905	0.501881227	0.308041101	0.20395022	0.506619542	0.312779415	0.208688534
0.041907061	0.027524922	0.069344457	0.042561749	0.02817961	0.069999146	0.043216438	0.028834298
0.132376665	0.086946143	0.219046332	0.134444704	0.089014183	0.221114372	0.136512744	0.091082223
0.374874469	0.246220808	0.620312331	0.380730904	0.252077243	0.626168766	0.386587339	0.257933678
0.042567288	0.027958565	0.070436949	0.043232291	0.028623567	0.071101951	0.043897294	0.02928857
0.006239344	0.004098055	0.010324368	0.006336817	0.004195529	0.010421841	0.006434291	0.004293002
2.002074209	1.314979735	3.312872503	2.033351392	1.346256918	3.344149686	2.064628574	1.377534101
0.173321075	0.113838788	0.286797872	0.176028764	0.116546477	0.289505561	0.178736453	0.119254166
24.41863792	16.03837355	40.40601181	24.80011539	16.41985101	40.78748928	25.18159286	16.80132848

MBD_5k_2.3_Low	MBD_5k_3.0_Avg	MBD_5k_3.0_High	MBD_5k_3.0_Low
46.35611243	29.10321315	19.6670648	47.10494018
0.511357856	0.321039791	0.21694891	0.519618232
0.070653834	0.044357766	0.029975627	0.071795162
0.223182412	0.14011799	0.094687469	0.226787657
0.632025201	0.396796953	0.268143292	0.642234815
0.071766954	0.045056603	0.03044788	0.072926264
0.010519315	0.006604218	0.004462929	0.010689242
3.375426868	2.119154572	1.432060098	3.429952866
0.292213251	0.18345681	0.123974523	0.296933607
41.16896674	25.84662845	17.46636407	41.83400233

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:32:38 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	CPD_20k_1.9_Avg
	Total		kg C2H4	79.12306867	46.94644596	161.3241409	97.62324852
1	Acetaldehyde	Air	kg C2H4	0.87281268	0.51786987	1.779579056	1.076889593
2	Acrolein	Air	kg C2H4	0.120595707	0.071553593	0.245882764	0.148792822
3	Benzene	Air	kg C2H4	0.380939565	0.226024584	0.776698238	0.470009043
4	Formaldehyde	Air	kg C2H4	1.078774098	0.640073884	2.199514094	1.331007931
5	Methane	Air	kg C2H4	0.122495639	0.072680888	0.249756539	0.151136988
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.017954923	0.010653275	0.03660832	0.022153058
7	Propene	Air	kg C2H4	5.761357411	3.418412087	11.74684009	7.108450617
8	Toluene	Air	kg C2H4	0.498765058	0.295934513	1.016932809	0.615383933
9	VOC, volatile organic compounds	Air	kg C2H4	70.26937359	41.69324326	143.272329	86.69942454

CPD_20k_1.9_High	CPD_20k_1.9_Low	CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low
57.35193574	200.4974793	116.1211314	67.75742553	239.6731147	152.7493742	88.39612878	317.1538158
0.632653632	2.211703176	1.280941166	0.747437393	2.643852635	1.684990142	0.975104522	3.498548231
0.087413157	0.305588948	0.176986436	0.103272722	0.365298632	0.232813503	0.134729275	0.483391119
0.276122018	0.965299043	0.559067462	0.326219453	1.153910907	0.735414855	0.425584894	1.526943261
0.781943671	2.733608429	1.583210445	0.923813457	3.267734083	2.082604621	1.205204193	4.32411593
0.088790313	0.310403367	0.17977478	0.104899738	0.371053751	0.236481377	0.136851875	0.491006733
0.013014531	0.04549769	0.026350672	0.015375786	0.054387582	0.034662499	0.020059203	0.071969813
4.176089294	14.59925225	8.455376566	4.933766501	17.45183167	11.12246724	6.43657659	23.09359985
0.361527201	1.263868282	0.731988329	0.427119888	1.510818234	0.96288038	0.557219292	1.999230362
50.93438193	178.0622581	103.1274355	60.17552059	212.8542272	135.6570596	78.50479893	281.6650105

MBD_20k_1.5_Avg	MBD_20k_1.5_High	MBD_20k_1.5_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low	MBD_20k_2.3_Avg
99.82608841	62.08149501	171.8329965	101.5442576	63.79966418	173.5511657	103.2601297
1.101189289	0.684825765	1.895503053	1.120142546	0.703779022	1.91445631	1.139070465
0.152150288	0.094621732	0.261899874	0.154769042	0.097240486	0.264518628	0.157384295
0.480614659	0.298892574	0.827293329	0.488886818	0.307164733	0.835565488	0.497147918
1.361041733	0.84642709	2.342793183	1.384467473	0.86985283	2.366218923	1.407861895
0.154547349	0.096112456	0.266025991	0.15720736	0.098772467	0.268686002	0.159863815
0.022652935	0.014087781	0.038993031	0.023042829	0.014477675	0.039382925	0.023432202
7.268850714	4.520472819	12.51204389	7.393959445	4.64558155	12.63715262	7.518900918
0.62926989	0.391340742	1.083177079	0.640100648	0.4021715	1.094007837	0.650916925
88.65577155	55.13471405	152.6052671	90.18168143	56.66062392	154.131177	91.70555131

MBD_20k_2.3_High	MBD_20k_2.3_Low	MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
65.51553634	175.2670379	106.2623318	68.51773836	178.2692399
0.72270694	1.933384228	1.172187987	0.755824463	1.96650175
0.099855738	0.26713388	0.161960112	0.104431555	0.271709697
0.315425833	0.843826588	0.511602078	0.329879994	0.858280749
0.893247252	2.389613344	1.448794303	0.93417966	2.430545753
0.101428921	0.271342457	0.164511722	0.106076828	0.275990364
0.014867048	0.039772298	0.024113474	0.015548319	0.040453569
4.770523023	12.76209409	7.737506682	4.989128787	12.98069986
0.412987777	1.104824114	0.669841791	0.431912643	1.12374898
58.18449381	155.6550469	94.37181361	60.85075611	158.3213092

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:25:52 PM		
Project	Thesis_Dredging Limited LCA						

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	summer smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	CPD_100k_1.9_Avg
	Total		kg C2H4	373.3181934	212.4304858	784.3258518	465.8122016
1	Acetaldehyde	Air	kg C2H4	4.118101818	2.343337092	8.651959034	5.138410364
2	Acrolein	Air	kg C2H4	0.568994255	0.323776682	1.195433042	0.709969327
3	Benzene	Air	kg C2H4	1.797347757	1.022750736	3.776152182	2.242661972
4	Formaldehyde	Air	kg C2H4	5.089868281	2.896304575	10.69359958	6.350943489
5	Methane	Air	kg C2H4	0.577958509	0.328877641	1.214266565	0.721154582
6	PAH, polycyclic aromatic hydrocarbons	Air	kg C2H4	0.084714858	0.048205576	0.177982361	0.105703969
7	Propene	Air	kg C2H4	27.18321693	15.4681558	57.11079758	33.91818119
8	Toluene	Air	kg C2H4	2.353271599	1.339089918	4.944124834	2.936322536
9	VOC, volatile organic compounds	Air	kg C2H4	331.5447194	188.6599878	696.5615366	413.6888542

CPD_100k_1.9_High	CPD_100k_1.9_Low	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	CPD_100k_3.0_Avg	CPD_100k_3.0_High
264.4579347	980.1925436	558.3039128	316.4853836	1176.061532	741.1396237	419.3642085
2.917255898	10.81257964	6.158693572	3.491174705	12.97322558	8.175568417	4.626038965
0.403074504	1.493963959	0.850940898	0.482372325	1.792498376	1.129610599	0.639175453
1.273237909	4.719156208	2.687965128	1.523725081	5.662171293	3.568231241	2.019037199
3.605653508	13.36407125	7.611987379	4.31500244	16.03457425	10.10479299	5.717665574
0.409424765	1.517500704	0.864347098	0.489971889	1.8207384	1.147407117	0.649245381
0.060011853	0.222429214	0.126692558	0.07181813	0.266876589	0.168182369	0.095163804
19.25654183	71.37285838	40.65297819	23.04492787	85.63508644	53.96618628	30.53606402
1.667053355	6.178802198	3.519358993	1.995016792	7.413494041	4.671893462	2.6435301
234.8656811	870.5111821	495.830949	281.0713744	1044.462867	658.2077512	372.438288

CPD_100k_3.0_Low	MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low
1563.152643	485.5987113	296.8757443	845.6286578	494.1803691	305.4574021	854.2103156
17.24325751	5.356676881	3.274859259	9.328195021	5.451341811	3.369524189	9.422859951
2.382484672	0.740127006	0.452484224	1.288867933	0.753206771	0.465563988	1.301947697
7.525829032	2.337924511	1.429314088	4.071295743	2.379241071	1.470630648	4.112612303
21.31222426	6.620715308	4.047642094	11.52940992	6.737718735	4.164645521	11.64641335
2.420019671	0.751787382	0.459612914	1.30917348	0.765073212	0.472898744	1.322459311
0.354716853	0.110194003	0.067368232	0.191893439	0.112141387	0.069315616	0.193840823
113.8211803	35.35893869	21.61704921	61.57457005	35.98381331	22.24192384	62.19944467
9.853585453	3.061049999	1.87140426	5.330556985	3.115145867	1.925500127	5.384652852
1388.239346	431.2612975	263.65601	751.0046953	438.882687	271.2773994	758.6260847

MBD_100k_2.3_Avg	MBD_100k_2.3_High	MBD_100k_2.3_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
502.7620269	314.0390599	862.7919734	517.7799281	329.056961	877.8098746
5.54600674	3.464189119	9.517524881	5.711670368	3.629852746	9.683188508
0.766286535	0.478643752	1.315027461	0.789176123	0.50153334	1.337917049
2.42055763	1.511947207	4.153928862	2.49286161	1.584251187	4.226232842
6.854722161	4.281648947	11.76341677	7.059478158	4.486404944	11.96817277
0.778359043	0.486184574	1.335745141	0.801609246	0.509434777	1.358995344
0.114088771	0.071263	0.195788207	0.117496693	0.074670922	0.199196129
36.60868794	22.86679846	62.8243193	37.70221853	23.96032905	63.91784989
3.169241734	1.979595995	5.43874872	3.263909503	2.074263763	5.533416488
446.5040764	278.8987888	766.2474741	459.8415078	292.2362203	779.5849056

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:29:11 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	CPD_1k_1.9_Avg
	Total		kg SPM	34.34891952	28.37964354	49.60468343	37.78551698
1	Particulates, < 10 um	Air	kg SPM	25.21356858	20.831866	36.41194847	27.73617736
2	Sulfur oxides	Air	kg SPM	9.135350936	7.547777536	13.19273495	10.04933962

CPD_1k_1.9_High	CPD_1k_1.9_Low	CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low
30.30686692	56.87867259	41.2135869	32.24261785	64.15266175	48.29144271	36.34436321	78.81149806
22.24652998	41.75136605	30.25252655	23.66745353	47.09078363	35.4479739	26.67830916	57.85099326
8.060336948	15.12730654	10.96106035	8.575164322	17.06187813	12.84346881	9.666054044	20.9605048

MBD_1k_1.5_Avg	MBD_1k_1.5_High	MBD_1k_1.5_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High
30.46889013	23.46778215	43.84006833	30.784409	23.78330103	44.15558721	31.09992788	24.0988199
22.3654619	17.22635073	32.18047569	22.59706618	17.45795501	32.41207997	22.82867046	17.68955929
8.103428226	6.241431424	11.65959264	8.18734282	6.325346018	11.74350724	8.271257414	6.409260612

MBD_1k_2.3_Low	MBD_1k_3.0_Avg	MBD_1k_3.0_High	MBD_1k_3.0_Low
44.47110608	31.66274533	24.66163735	45.03392353
32.64368425	23.24180242	18.10269125	33.05681621
11.82742183	8.420942906	6.558946104	11.97710732

SimaPro 7.1	Inventory	Date:	8/13/2008	Time: 3:35:29 PM
Project	Thesis_Dredging Limited LCA			

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	CPD_5k_1.9_Avg
	Total		kg SPM	88.95926724	59.09583224	165.2466143	106.1251995
1	Particulates, < 10 um	Air	kg SPM	65.29988765	43.37885558	121.2980467	77.90041237
2	Sulfur oxides	Air	kg SPM	23.65937958	15.71697666	43.94856764	28.22478709

CPD_5k_1.9_High	CPD_5k_1.9_Low	CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low
68.74900426	201.6080326	123.2911317	78.41070382	237.9609233	157.5121381	97.77674062	310.0953598
50.46469462	147.988875	90.50093708	57.55679323	174.6734437	115.620612	71.77228833	227.6231897
18.28430964	53.6191576	32.7901946	20.85391059	63.28747961	41.8915261	26.00445229	82.47217017

MBD_5k_1.5_Avg	MBD_5k_1.5_High	MBD_5k_1.5_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High
102.0746193	67.04349684	168.9049277	103.6692688	68.63814628	170.4995772	105.2639182	70.23279572
74.92711419	49.21277959	123.9834044	76.09765473	50.38332014	125.1539449	77.26819528	51.55386069
27.14750514	17.83071724	44.92152333	27.57161403	18.25482614	45.34563223	27.99572293	18.67893503

MBD_5k_2.3_Low	MBD_5k_3.0_Avg	MBD_5k_3.0_High	MBD_5k_3.0_Low
172.0942266	108.0438953	73.01277282	174.8742037
126.3244855	79.30881677	53.59448218	128.365107
45.76974112	28.73507854	19.41829064	46.50909673

SimaPro 7.1	Inventory	Date:	8/13/2008	Time: 3:32:26 PM
Project	Thesis_Dredging Limited LCA			

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	CPD_20k_1.9_Avg
	Total		kg SPM	293.7395436	174.2858037	598.905987	362.4203276
1	Particulates, < 10 um	Air	kg SPM	215.6173246	127.9331963	439.6224798	266.0319426
2	Sulfur oxides	Air	kg SPM	78.12221905	46.35260736	159.2835072	96.388385

CPD_20k_1.9_High	CPD_20k_1.9_Low	CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low
212.9155468	744.3346051	431.092584	251.54529	889.7717506	567.0726909	328.165211	1177.414105
156.2890716	546.3732739	316.440301	184.6449469	653.1303276	416.2554859	240.8872293	864.272056
56.62647522	197.9613311	114.652283	66.90034308	236.641423	150.817205	87.27798165	313.1420493

MBD_20k_1.5_Avg	MBD_20k_1.5_High	MBD_20k_1.5_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low	MBD_20k_2.3_Avg
370.5982357	230.4737457	637.9194693	376.9768335	236.8523435	644.2980671	383.3469037
272.0348751	169.1775368	468.260036	276.7170373	173.859699	472.9421982	281.3929399
98.56336056	61.29620897	169.6594333	100.2597961	62.99264455	171.3558689	101.9539637

MBD_20k_2.3_High	MBD_20k_2.3_Low	MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
243.2224137	650.6681373	394.4923947	254.3679048	661.8136283
178.5356016	477.6181008	289.5742046	186.7168663	485.7993655
64.68681216	173.0500365	104.9181901	67.6510385	176.0142629

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:25:37 PM			
Project	Thesis_Dredging Limited LCA							

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Skip unused:	Yes
Indicator:	Characterization
Category:	winter smog
Cut-off:	0%
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	CPD_100k_1.9_Avg
	Total		kg SPM	1385.920915	788.6351604	2911.76166	1729.299253
1	Particulates, < 10 um	Air	kg SPM	1017.324927	578.8917667	2137.356963	1269.379239
2	Sulfur oxides	Air	kg SPM	368.5959881	209.7433937	774.4046967	459.920014

CPD_100k_1.9_High	CPD_100k_1.9_Low	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	CPD_100k_3.0_Avg	CPD_100k_3.0_High
981.7838762	3638.90475	2072.669062	1174.932592	4366.056368	2751.435434	1556.863924
720.6711431	2671.110934	1521.42729	862.4505196	3204.871164	2019.670691	1142.80437
261.112733	967.7938165	551.2417719	312.4820723	1161.185204	731.7647432	414.0595544

CPD_100k_3.0_Low	MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low
5803.108396	1802.755457	1102.133008	3139.34457	1834.614336	1133.991886	3171.203449
4259.728503	1323.299219	809.0125268	2304.412504	1346.684991	832.3982995	2327.798276
1543.379892	479.4562386	293.1204807	834.9320666	487.9293447	301.5935868	843.4051726

MBD_100k_2.3_Avg	MBD_100k_2.3_High	MBD_100k_2.3_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
1866.473215	1165.850765	3203.062328	1922.226252	1221.603803	3258.815365
1370.070764	855.7840721	2351.184049	1410.995866	896.7091742	2392.109151
496.4024507	310.0666928	851.8782787	511.2303863	324.8946283	866.7062142

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:27:53 PM		
Project	Thesis_Dredging Limited LCA						

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	CPD_1k_1.9_Avg
1	Acetaldehyde	Air	kg	0.19366944	0.160012884	0.279685981	0.213046
2	Acrolein	Air	kg	0.023386498	0.01932231	0.033773401	0.025726309
3	Benzene	Air	kg	0.235692054	0.19473266	0.340372562	0.259272962
4	Butadiene	Air	kg	0.00990272	0.008181791	0.014300925	0.010893484
5	Carbon dioxide, fossil	Air	kg	41109.07921	33964.99891	59367.30729	45222.0283
6	Carbon monoxide	Air	kg	213.7672119	176.6179943	308.7099979	235.1545472
7	Formaldehyde	Air	kg	0.299639511	0.247567103	0.432721706	0.32961834
8	Methane	Air	kg	2.04631861	1.690702168	2.95517263	2.251052075
9	Nitric oxide	Air	kg	805.7379526	665.7139787	1163.599223	886.3517547
10	Nitrogen oxides	Air	kg	1.034121726	0.854408417	1.493417597	1.137585245
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	0.042570735	0.035172643	0.061478145	0.046829923
12	Particulates, < 10 um	Air	kg	25.21356858	20.831866	36.41194847	27.73617736
13	Propene	Air	kg	0.654091127	0.540420872	0.944599823	0.719532717
14	Sulfur oxides	Air	kg	9.135350936	7.547777536	13.19273495	10.04933962
15	Toluene	Air	kg	0.10359488	0.085591797	0.149605614	0.113959511
16	VOC, volatile organic compounds	Air	kg	20.64589312	17.05797723	29.815581	22.71150755
17	Xylene	Air	kg	0.072169272	0.059627443	0.104222606	0.079389783

CPD_1k_1.9_High	CPD_1k_1.9_Low	CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low
0.170879143	0.320698899	0.232374479	0.181793484	0.361711816	0.272281539	0.204920346	0.444362702
0.020634463	0.038725905	0.028060314	0.021952421	0.043678408	0.03287928	0.024745098	0.053658892
0.207956693	0.390284509	0.282795357	0.22123924	0.440196456	0.331361495	0.249384194	0.540781024
0.008737405	0.016398	0.011881789	0.009295478	0.018495076	0.01392232	0.010478003	0.022721187
36271.51627	68072.87943	49324.77156	38588.23945	76778.45157	57795.60963	43497.2432	94322.27162
188.6118846	353.978973	256.4888121	200.6588451	399.2479481	300.5371701	226.1856646	490.4758124
0.264379052	0.496175655	0.359522779	0.28126539	0.559629603	0.421265777	0.317046573	0.687504558
1.805515476	3.388516665	2.455277518	1.920836808	3.8218607	2.876937013	2.165196106	4.695153076
710.9217188	1334.228437	966.7655225	756.3294932	1504.857651	1132.793949	852.5459667	1848.716524
0.912430143	1.7124111	1.240792031	0.970708601	1.931404604	1.453880669	1.094197318	2.372729144
0.03756117	0.070493248	0.051078541	0.039960266	0.079508352	0.059850565	0.045043812	0.097675952
22.24652998	41.75136605	30.25252655	23.66745353	47.09078363	35.4479739	26.67830916	57.85099326
0.577120125	1.083115148	0.784811921	0.613981765	1.221630474	0.919592367	0.69208947	1.500772144
8.060336948	15.12730654	10.96106035	8.575164322	17.06187813	12.84346881	9.666054044	20.9605048
0.091404221	0.171543656	0.124298424	0.097242363	0.193481698	0.145644936	0.109613053	0.237692124
18.2163615	34.18771278	24.77199638	19.37987137	38.55984456	29.0262395	21.84528214	47.37074086
0.063676662	0.119505722	0.086592377	0.067743798	0.134788837	0.101463404	0.076361827	0.165587988

MBD_1k_1.5_Avg	MBD_1k_1.5_High	MBD_1k_1.5_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High
0.171792678	0.132318346	0.247183364	0.173571668	0.134097336	0.248962353	0.175350657	0.135876325
0.020744776	0.015978064	0.029848557	0.020959598	0.016192886	0.030063379	0.021174419	0.016407707
0.209068448	0.161028931	0.30081749	0.211233445	0.163193927	0.302982487	0.213398441	0.165358924
0.008784116	0.006765712	0.012638998	0.00887508	0.006856675	0.012729962	0.008966043	0.006947639
36465.42702	28086.44141	52468.16689	36843.04269	28464.05708	52845.78256	37220.65836	28841.67275
189.6202205	146.0494953	272.8344678	191.583822	148.0130968	274.7980693	193.5474235	149.9766983
0.265792446	0.204718951	0.382434639	0.268544844	0.207471349	0.385187037	0.271297243	0.210223748
1.815167923	1.398080639	2.611748752	1.833964792	1.416877508	2.630545621	1.852761661	1.435674377
714.7223695	550.4942516	1028.376071	722.1236367	557.8955188	1035.777338	729.5249039	565.296786
0.917308075	0.706530037	1.319865887	0.926807207	0.716029169	1.329365019	0.936306339	0.725528301
0.037761976	0.02908507	0.054333702	0.038153018	0.029476112	0.054724744	0.03854406	0.029867154
22.3654619	17.22635073	32.18047569	22.59706618	17.45795501	32.41207997	22.82867046	17.68955929
0.580205461	0.44688649	0.834826833	0.586213746	0.452894775	0.840835118	0.592222031	0.45890306
8.103428226	6.241431424	11.65959264	8.18734282	6.325346018	11.74350724	8.271257414	6.409260612
0.091892876	0.070777832	0.132219781	0.092844468	0.071729424	0.133171372	0.093796059	0.072681015
18.31374779	14.10563502	26.35067937	18.50339477	14.295282	26.54032635	18.69304176	14.48492898
0.064017083	0.049307308	0.092110782	0.064680008	0.049970234	0.092773707	0.065342934	0.050633159

MBD_1k_2.3_Low	MBD_1k_3.0_Avg	MBD_1k_3.0_High	MBD_1k_3.0_Low
0.250741343	0.17852399	0.139049657	0.253914675
0.0302782	0.021557614	0.016790902	0.030661395
0.305147483	0.217260327	0.169220809	0.309009369
0.012820925	0.009128302	0.007109898	0.012983184
53223.39824	37894.24308	29515.25747	53896.98295
276.7616708	197.050064	153.4793388	280.2643113
0.387939436	0.276206927	0.215133432	0.39284912
2.64934249	1.886291211	1.469203927	2.68287204
1043.178605	742.7271643	578.4990464	1056.380866
1.338864151	0.953250737	0.742472699	1.355808549
0.055115786	0.039241594	0.030564689	0.05581332
32.64368425	23.24180242	18.10269125	33.05681621
0.846843403	0.602939512	0.469620541	0.857560884
11.82742183	8.420942906	6.558946104	11.97710732
0.134122964	0.095493493	0.074378449	0.135820397
26.72997334	19.03133097	14.8232182	27.06826255
0.093436632	0.066525449	0.051815674	0.094619148

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:33:57 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	CPD_5k_1.9_Avg
1	Acetaldehyde	Air	kg	0.501578847	0.333199905	0.931709634	0.598365486
2	Acrolein	Air	kg	0.060568012	0.04023546	0.112508333	0.072255455
3	Benzene	Air	kg	0.610411993	0.405497998	1.133873045	0.728199507
4	Butadiene	Air	kg	0.025646767	0.017037203	0.047640247	0.030595669
5	Carbon dioxide, fossil	Air	kg	106467.2081	70726.39497	197768.5544	127011.5419
6	Carbon monoxide	Air	kg	553.6294823	367.7772538	1028.396483	660.4600179
7	Formaldehyde	Air	kg	0.77602765	0.515516834	1.441513018	0.925773017
8	Methane	Air	kg	5.299701027	3.520602772	9.84447915	6.322352308
9	Nitric oxide	Air	kg	2086.757279	1386.237341	3876.263665	2489.426221
10	Nitrogen oxides	Air	kg	2.678241769	1.779161758	4.974977856	3.195045899
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	0.110252709	0.073241111	0.204800325	0.131527508
12	Particulates, < 10 um	Air	kg	65.29988765	43.37885558	121.2980467	77.90041237
13	Propene	Air	kg	1.694011578	1.125335529	3.146717443	2.020894756
14	Sulfur oxides	Air	kg	23.65937958	15.71697666	43.94856764	28.22478709
15	Toluene	Air	kg	0.268297364	0.178230515	0.498376757	0.320069086
16	VOC, volatile organic compounds	Air	kg	53.47019786	35.52036725	99.32376286	63.78801882
17	Xylene	Air	kg	0.186909099	0.124164116	0.347193684	0.222975818

CPD_5k_1.9_High	CPD_5k_1.9_Low	CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low
0.387627364	1.136726141	0.695152125	0.442102905	1.341694568	0.888100353	0.551294389	1.748410008
0.046807833	0.137265043	0.083942898	0.053386011	0.162015948	0.107242307	0.066571398	0.211128756
0.471735189	1.383374266	0.845987021	0.538030893	1.632816974	1.080801373	0.670914869	2.12778199
0.019820192	0.058123167	0.035544571	0.022605639	0.068603628	0.045410414	0.028188826	0.089399832
82279.3934	241286.2092	147555.8757	93842.59766	284793.6582	188511.8675	117020.0353	371124.7658
427.8528457	1254.688288	767.2905535	487.9815078	1480.927023	980.2617108	608.5041836	1929.848782
0.599725356	1.758708369	1.075518383	0.684008267	2.075829331	1.374042056	0.852946035	2.705087182
4.09568536	12.0106913	7.34500359	4.671275972	14.17639543	9.383701847	5.824997313	18.47376612
1612.676111	4729.209701	2892.095163	1839.314914	5581.955702	3694.832602	2293.592692	7274.045409
2.069783852	6.069688641	3.711850028	2.360662679	7.164142692	4.742120755	2.943703999	9.335849663
0.085204883	0.249865274	0.152802307	0.097179223	0.294919655	0.195214512	0.121180748	0.384320313
50.46469462	147.988875	90.50093708	57.55679323	174.6734437	115.620612	71.77228833	227.6231897
1.309156571	3.839131684	2.347777933	1.493139998	4.53138354	2.999433269	1.861918784	5.905007384
18.28430964	53.6191576	32.7901946	20.85391059	63.28747961	41.8915261	26.00445229	82.47217017
0.207344071	0.608041247	0.371840807	0.236483346	0.717680019	0.475049906	0.294890489	0.93523441
41.3225398	121.1792962	74.10583979	47.12983793	143.0297039	94.67484899	58.77006218	186.3871046
0.144446046	0.423591345	0.259042537	0.164745894	0.499971089	0.330943056	0.205435173	0.651530144

MBD_5k_1.5_Avg	MBD_5k_1.5_High	MBD_5k_1.5_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High
0.575527109	0.378011206	0.952336295	0.584518218	0.387002314	0.961327403	0.593509326	0.395993423
0.069497613	0.045646636	0.1149991	0.070583332	0.046732355	0.116084819	0.071669051	0.047818074
0.700405633	0.460032505	1.158975302	0.711347642	0.470974514	1.169917311	0.722289652	0.481916524
0.029427896	0.019328497	0.048694931	0.02988763	0.019788232	0.049154665	0.030347364	0.020247966
122163.7731	80238.2276	202146.855	124072.2632	82146.71762	204055.345	125980.7532	84055.20764
635.2516203	417.2387835	1051.163646	645.1757684	427.1629316	1061.087794	655.0999165	437.0870797
0.890438169	0.584847526	1.473425965	0.90434894	0.598758297	1.487336737	0.918259712	0.612669069
6.081041151	3.994080663	10.06242123	6.176041544	4.089081055	10.15742162	6.271041936	4.184081447
2394.409953	1572.669261	3962.078358	2431.816358	1610.075665	3999.484763	2469.222762	1647.48207
3.073097582	2.018437192	5.085116441	3.121106709	2.066446319	5.133125568	3.169115835	2.114455446
0.126507374	0.083091142	0.209334299	0.128483721	0.08506749	0.211310646	0.130460069	0.087043837
74.92711419	49.21277959	123.9834044	76.09765473	50.38332014	125.1539449	77.26819528	51.55386069
1.943761368	1.276679355	3.216381071	1.974127565	1.307045551	3.246747268	2.004493762	1.337411748
27.14750514	17.83071724	44.92152333	27.57161403	18.25482614	45.34563223	27.99572293	18.67893503
0.307852708	0.202200334	0.509410075	0.312662103	0.207009728	0.514219469	0.317471498	0.211819123
61.35336162	40.29742097	101.5226427	62.31184772	41.25590707	102.4811288	63.27033382	42.21439317
0.214465291	0.140862666	0.354880034	0.217815751	0.144213126	0.358230495	0.221166211	0.147563587

MBD_5k_2.3_Low	MBD_5k_3.0_Avg	MBD_5k_3.0_High	MBD_5k_3.0_Low
0.970318512	0.609183665	0.411667762	0.985992851
0.117170537	0.073561801	0.049710824	0.119063288
1.180859321	0.741365026	0.500991899	1.199934696
0.049614399	0.031148825	0.021049427	0.050415861
205963.835	129307.8534	87382.3079	209290.9353
1071.011942	672.4008378	454.3880011	1088.312864
1.501247509	0.942510576	0.636919933	1.525498373
10.25242201	6.436657593	4.349697104	10.41803767
4036.891167	2534.433927	1712.693235	4102.102332
5.181134695	3.252810891	2.198150501	5.26482975
0.213286994	0.133905466	0.090489234	0.216732391
126.3244855	79.30881677	53.59448218	128.365107
3.277113464	2.057431623	1.39034961	3.330051326
45.76974112	28.73507854	19.41829064	46.50909673
0.519028864	0.325855791	0.220203416	0.527413157
103.4396149	64.9412775	43.88533686	105.1105586
0.361580955	0.22700712	0.153404496	0.367421864

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:31:05 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	CPD_20k_1.9_Avg
1	Acetaldehyde	Air	kg	1.656191044	0.982675276	3.376810352	2.043433762
2	Acrolein	Air	kg	0.199992881	0.118662675	0.407765778	0.246754266
3	Benzene	Air	kg	2.015553252	1.19589727	4.109514485	2.486820333
4	Butadiene	Air	kg	0.084684485	0.050246226	0.172663322	0.104485009
5	Carbon dioxide, fossil	Air	kg	351549.9857	208586.7331	716775.7823	433747.7325
6	Carbon monoxide	Air	kg	1828.059926	1084.651012	3727.234068	2255.488209
7	Formaldehyde	Air	kg	2.562408785	1.520365521	5.224499036	3.161539028
8	Methane	Air	kg	17.49937707	10.38298405	35.67950561	21.59099824
9	Nitric oxide	Air	kg	6890.37972	4088.299969	14048.80533	8501.455557
10	Nitrogen oxides	Air	kg	8.843435197	5.247115153	18.03089301	10.91116518
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	0.364049541	0.21600315	0.742261143	0.449169874
12	Particulates, < 10 um	Air	kg	215.6173246	127.9331963	439.6224798	266.0319426
13	Propene	Air	kg	5.593550884	3.318846687	11.40469911	6.901408366
14	Sulfur oxides	Air	kg	78.12221905	46.35260736	159.2835072	96.388385
15	Toluene	Air	kg	0.885905964	0.525638567	1.806274971	1.093044286
16	VOC, volatile organic compounds	Air	kg	176.5562151	104.7568926	359.9807262	217.8377501
17	Xylene	Air	kg	0.617165531	0.366185598	1.258339707	0.761468242

CPD_20k_1.9_High	CPD_20k_1.9_Low	CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low
1.200481275	4.19678022	2.430628399	1.418287273	5.016798168	3.197324747	1.850293211	6.638611444
0.144963777	0.506781008	0.293509844	0.171264878	0.605802043	0.386092045	0.223431633	0.801643646
1.460963061	5.107402343	2.958028901	1.726028851	6.105348714	3.89108389	2.251771926	8.079064871
0.061383099	0.214590083	0.124283075	0.072519972	0.256519303	0.16348585	0.094609332	0.339445981
254819.1385	890825.9901	515935.2734	301051.5438	1064886.404	678677.4227	392750.9174	1409139.222
1325.05952	4632.295148	2682.863422	1565.468028	5537.409299	3529.122598	2042.304771	7327.523953
1.857348387	6.493131661	3.760594882	2.194331253	7.761838676	4.946804325	2.862717798	10.27105922
12.68433045	44.34333817	25.68211139	14.98567685	53.00767876	33.78305393	19.55026789	70.14381904
4994.455114	17460.18941	10112.33136	5900.610259	20871.77351	13302.07748	7697.917981	27619.12875
6.410116994	22.40922268	12.97863843	7.573118836	26.78780909	17.07250761	9.879867522	35.44767998
0.263879375	0.922499803	0.534279639	0.311755599	1.102749031	0.702808175	0.406715394	1.45924195
156.2890716	546.3732739	316.440301	184.6449469	653.1303276	416.2554859	240.8872293	864.272056
4.054455625	14.17403131	8.209103462	4.790064564	16.94352589	10.79851188	6.249103486	22.42097073
56.62647522	197.9613311	114.652283	66.90034308	236.641423	150.817205	87.27798165	313.1420493
0.642144229	2.244881495	1.300156889	0.75864989	2.683513737	1.710267105	0.989732312	3.551030839
127.975834	447.3926084	259.1141595	151.1947754	534.8096161	340.8468834	197.2482385	707.7010313
0.447349154	1.563894516	0.905753036	0.52851271	1.869467242	1.19145592	0.689496055	2.473822189

MBD_20k_1.5_Avg	MBD_20k_1.5_High	MBD_20k_1.5_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low	MBD_20k_2.3_Avg
2.089543244	1.29947963	3.596779987	2.125507678	1.335444064	3.632744421	2.161424031
0.252322203	0.156918295	0.434328149	0.256665078	0.16126117	0.438671024	0.261002147
2.542934702	1.581442192	4.37721338	2.58670274	1.625210229	4.420981418	2.630412265
0.106842683	0.066445091	0.183910826	0.108681619	0.068284027	0.185749762	0.110518097
443535.1225	275832.9404	763467.45	451169.0826	283466.9005	771101.4101	458792.8369
2306.382637	1434.33129	3970.03074	2346.07923	1474.027882	4009.727332	2385.722752
3.232878226	2.010515654	5.564829413	3.288521313	2.066158741	5.6204725	3.344090011
22.07819276	13.73035081	38.00371307	22.45819433	14.11035238	38.38371464	22.83768788
8693.288401	5406.325632	14963.96202	8842.914019	5555.951249	15113.58764	8992.339603
11.15737242	6.938730856	19.20544785	11.34940892	7.130767363	19.39748436	11.5411887
0.45930526	0.285640334	0.790612959	0.46721065	0.293545724	0.798518349	0.475105471
272.0348751	169.1775368	468.260036	276.7170373	173.859699	472.9421982	281.3929399
7.057136616	4.388808563	12.14761543	7.178601403	4.51027335	12.26908021	7.299903804
98.56336056	61.29620897	169.6594333	100.2597961	62.99264455	171.3558689	101.9539637
1.117708509	0.69509901	1.923937974	1.136946088	0.714336589	1.943175553	1.156157949
222.7531949	138.5294323	383.4303193	226.5871393	142.3633767	387.2642637	230.4159581
0.778650548	0.484240051	1.340309523	0.792052389	0.497641892	1.353711364	0.805436314

MBD_20k_2.3_High	MBD_20k_2.3_Low	MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
1.371360418	3.668660774	2.22426563	1.434202016	3.731502373
0.165598239	0.443008094	0.268590567	0.173186659	0.450596513
1.668919754	4.464690942	2.706889304	1.745396793	4.541167982
0.070120504	0.18758624	0.113731318	0.073333726	0.190799461
291090.6547	778725.1644	472131.8554	304429.6732	792064.1829
1513.671405	4049.370855	2455.085648	1583.034301	4118.733751
2.121727439	5.676041198	3.441316635	2.218954063	5.773267822
14.48984592	38.76320818	23.50167458	15.15383262	39.42719488
5705.376833	15263.01322	9253.784365	5966.821596	15524.45798
7.322547137	19.58926413	11.87673912	7.658097558	19.92481456
0.301440545	0.80641317	0.488918766	0.315253839	0.820226465
178.5356016	477.6181008	289.5742046	186.7168663	485.7993655
4.631575751	12.39038262	7.51214241	4.843814356	12.60262122
64.68681216	173.0500365	104.9181901	67.6510385	176.0142629
0.73354845	1.962387414	1.189772276	0.767162777	1.996001741
146.1921955	391.0930825	237.1151096	152.891347	397.7922341
0.511025816	1.367095289	0.828853702	0.534443204	1.390512677

SimaPro 7.1	Inventory	Date:	8/13/2008	Time:	3:22:33 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Per sub-compartment:	No
Default units:	Yes
Indicator:	Inventory
Relative mode:	Non

No	Substance	Compartment	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	CPD_100k_1.9_Avg
1	Acetaldehyde	Air	kg	7.814234948	4.446559947	16.41737957	9.750304296
2	Acrolein	Air	kg	0.94360573	0.536943088	1.982476024	1.177395236
3	Benzene	Air	kg	9.509776494	5.411379558	19.97964118	11.86593636
4	Butadiene	Air	kg	0.399558051	0.227361839	0.839454691	0.498553295
5	Carbon dioxide, fossil	Air	kg	1658681.947	943845.2717	3484821.135	2069640.063
6	Carbon monoxide	Air	kg	8625.146122	4907.995413	18121.0699	10762.12833
7	Formaldehyde	Air	kg	12.08994841	6.879583314	25.40047405	15.08537646
8	Methane	Air	kg	82.56550134	46.98252019	173.4666521	103.0220831
9	Nitric oxide	Air	kg	32510.16615	18499.36733	68302.49425	40564.94523
10	Nitrogen oxides	Air	kg	41.72506586	23.74295217	87.66261167	52.06294558
11	PAH, polycyclic aromatic hydrocarbons	Air	kg	1.717657305	0.977404215	3.608725887	2.143227265
12	Particulates, < 10 um	Air	kg	1017.324927	578.8917667	2137.356963	1269.379239
13	Propene	Air	kg	26.39147275	15.01762699	55.44737629	32.930273
14	Sulfur oxides	Air	kg	368.5959881	209.7433937	774.4046967	459.920014
15	Toluene	Air	kg	4.179878505	2.378490085	8.781749261	5.215492959
16	VOC, volatile organic compounds	Air	kg	833.0269332	474.0200698	1750.154615	1039.419232
17	Xylene	Air	kg	2.911908306	1.65697281	6.117797104	3.63336811

CPD_100k_1.9_High	CPD_100k_1.9_Low	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	CPD_100k_3.0_Avg	CPD_100k_3.0_High
5.53558994	20.51722891	11.68632556	6.624619933	24.61712633	15.51341256	8.778062553
0.668448597	2.47755217	1.411178936	0.799954105	2.972634123	1.873317743	1.059992459
6.736708512	24.96908047	14.22203771	8.062037466	29.95857827	18.87953037	10.6827365
0.283046203	1.049088497	0.597546081	0.338730566	1.258724761	0.793232982	0.448840557
1175007.299	4355072.174	2480587.973	1406169.325	5225333.419	3292941.344	1863267.995
6110.037953	22646.37531	12899.05746	7312.080492	27171.73378	17123.29499	9688.993572
8.564497643	31.74363718	18.08073012	10.24941197	38.0868747	24.00188358	13.58115338
58.4892522	216.7858149	123.4781569	69.9959842	260.1054857	163.9153025	92.74934018
23030.14305	85359.41461	48619.52428	27560.91878	102416.535	64541.65035	36520.0527
29.55796138	109.55426	62.40056858	35.37297059	131.4461651	82.83576893	46.87154156
1.216785336	4.509919185	2.568786657	1.456166457	5.411123052	3.410023703	1.929517523
720.6711431	2671.110934	1521.42729	862.4505196	3204.871164	2019.670691	1142.80437
18.69567168	69.29403726	39.46891087	22.37371638	83.14086062	52.39435561	29.64666409
261.112733	967.7938165	551.2417719	312.4820723	1161.185204	731.7647432	414.0595544
2.961018392	10.97478188	6.251081693	3.5435467	13.16784022	8.298212188	4.695435347
590.1147766	2187.214025	1245.806404	706.2094834	2624.278561	1653.78832	935.7745929
2.062790591	7.64557115	4.354809998	2.468608371	9.173363113	5.780941471	3.27107048

CPD_100k_3.0_Low	MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low
32.71965372	10.16447226	6.214154191	17.70055981	10.34410211	6.393784039	17.88018966
3.951052525	1.227407971	0.750388431	2.137426091	1.249099122	0.772079582	2.159117242
39.81920123	12.36997096	7.562508403	21.54124732	12.58857709	7.781114538	21.75985345
1.673023803	0.519730563	0.317742601	0.90506636	0.52891541	0.326927448	0.914251207
6945209.516	2157553.074	1319042.163	3757194.3	2195682.051	1357171.14	3795323.277
36115.08948	11219.27598	6859.019249	19537.41036	11417.54667	7057.28993	19735.68104
50.62286047	15.72616463	9.614351768	27.38577178	16.00408251	9.892269646	27.66368966
345.7170959	107.3981975	65.65898768	187.0247829	109.2961732	67.55696343	188.9227587
136126.1065	42288.04025	25853.2264	73641.00827	43035.3682	26600.55435	74388.33623
174.7106038	54.27444621	33.18123842	94.51430994	55.23360182	34.14039402	95.47346554
7.192150299	2.234266072	1.36594144	3.89078343	2.273750746	1.405426114	3.930268104
4259.728503	1323.299219	809.0125268	2304.412504	1346.684991	832.3982995	2327.798276
110.5060003	34.32906669	20.98742642	59.78113597	34.93574108	21.59410081	60.38781036
1543.379892	479.4562386	293.1204807	834.9320666	487.9293447	301.5935868	843.4051726
17.50192798	5.437033746	3.323986251	9.468129635	5.533118769	3.420071274	9.564214658
3488.038557	1083.571099	662.4522864	1886.946471	1102.720319	681.6015061	1906.09569
12.19270115	3.787704285	2.315651798	6.595963326	3.854641823	2.382589335	6.662900864

MBD_100k_2.3_Avg	MBD_100k_2.3_High	MBD_100k_2.3_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
10.52373196	6.573413887	18.05981951	10.83808419	6.887766121	18.37417174
1.270790274	0.793770734	2.180808393	1.308749789	0.831730249	2.218767908
12.80718323	7.999720674	21.97845959	13.18974397	8.382281411	22.36102033
0.538100257	0.336112295	0.923436054	0.554173739	0.352185777	0.939509536
2233811.028	1395300.118	3833452.254	2300536.738	1462025.828	3900177.964
11615.81735	7255.560611	19933.95172	11962.79104	7602.534303	20280.92541
16.28200038	10.17018752	27.94160754	16.76835667	10.65654381	28.42796383
111.194149	69.45493919	190.8207344	114.5156065	72.77639675	194.142192
43782.69615	27347.8823	75135.66418	45090.52007	28655.70622	76443.48809
56.19275742	35.09954962	96.43262115	57.87127973	36.77807193	98.11114345
2.31323542	1.444910788	3.969752779	2.3823336	1.514008968	4.038850958
1370.070764	855.7840721	2351.184049	1410.995866	896.7091742	2392.109151
35.54241547	22.2007752	60.99448475	36.60409566	23.26245539	62.05616494
496.4024507	310.0666928	851.8782787	511.2303863	324.8946283	866.7062142
5.629203791	3.516156296	9.66029968	5.79735258	3.684305085	9.828448469
1121.869539	700.7507257	1925.24491	1155.380673	734.2618601	1958.756044
3.921579361	2.449526873	6.729838401	4.038720052	2.566667564	6.846979092

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:27:41 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Single score
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_1k_1.5_Avg	CPD_1k_1.5_High	CPD_1k_1.5_Low	CPD_1k_1.9_Avg	CPD_1k_1.9_High	CPD_1k_1.9_Low
Total	Pt	128.3165055	106.0172121	185.3071282	141.1545272	113.2166982	212.48041
greenhouse	Pt	7.866416342	6.499362857	11.36021446	8.653448563	6.940725839	13.02606678
acidification	Pt	77.43349747	63.97683207	111.8248895	85.18069198	68.32141261	128.2227974
eutrophication	Pt	21.12794545	17.45625682	30.51173254	23.24178905	18.64168772	34.98594741
carcinogens	Pt	18.77744549	15.514235	27.11727915	20.65612238	16.56778582	31.09373421
winter smog	Pt	1.820492735	1.504121107	2.629048222	2.0026324	1.606263947	3.014569647
summer smog	Pt	1.290707978	1.066404209	1.863964327	1.419842863	1.138822283	2.137294493

CPD_1k_2.3_Avg	CPD_1k_2.3_High	CPD_1k_2.3_Low	CPD_1k_3.0_Avg	CPD_1k_3.0_High	CPD_1k_3.0_Low	MBD_1k_1.5_Avg	MBD_1k_1.5_High
153.9606929	120.4480405	239.6536918	180.4012836	135.7708407	294.4143852	113.8219648	87.6680792
9.43852785	7.384041755	14.6919191	11.0594627	8.323402793	18.04901188	6.977831577	5.374473131
92.90866268	72.68521696	144.6207054	108.8644231	81.93186847	177.6664309	68.68666496	52.90391883
25.35038738	19.83236389	39.46016227	29.70396104	22.35533851	48.4767805	18.74134784	14.4349816
22.53013755	17.62599836	35.07018928	26.39937284	19.86829014	43.08370189	16.65635867	12.82907894
2.184320106	1.708858746	3.400091073	2.559446464	1.92625125	4.177009397	1.614851177	1.243792454
1.548657314	1.211560791	2.410624658	1.814617498	1.365689524	2.96145063	1.144910528	0.881834249

MBD_1k_1.5_Low	MBD_1k_1.9_Avg	MBD_1k_1.9_High	MBD_1k_1.9_Low	MBD_1k_2.3_Avg	MBD_1k_2.3_High	MBD_1k_2.3_Low	MBD_1k_3.0_Avg
163.772382	115.0006417	88.84675614	164.9510589	116.1793186	90.02543308	166.1297358	118.2818234
10.04003138	7.050090118	5.446731673	10.11228993	7.122348659	5.518990214	10.18454847	7.251242274
98.82959545	69.39794585	53.61519971	99.54087634	70.10922673	54.3264806	100.2521572	71.37799804
26.96593038	18.93542281	14.62905657	27.16000535	19.12949778	14.82313154	27.35408032	19.47568556
23.96595016	16.82884266	13.00156293	24.13843415	17.00132664	13.17404691	24.31091813	17.30900077
2.323523622	1.631573677	1.260514954	2.340246122	1.648296177	1.277237455	2.356968622	1.678125502
1.647350973	1.156766584	0.893690306	1.659207029	1.168622641	0.905546362	1.671063085	1.189771282

MBD_1k_3.0_High	MBD_1k_3.0_Low
92.12793788	168.2322407
5.647883829	10.31344208
55.59525191	101.5209285
15.16931933	27.7002681
13.48172104	24.61859226
1.30706678	2.386797947
0.926695003	1.692211726

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:33:38 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Single score
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_5k_1.5_Avg	CPD_5k_1.5_High	CPD_5k_1.5_Low	CPD_5k_1.9_Avg	CPD_5k_1.9_High	CPD_5k_1.9_Low
Total	Pt	332.323184	220.7630047	617.3081536	396.4495806	256.8241477	753.1427066
greenhouse	Pt	20.3730028	13.53382951	37.84394634	24.30425804	15.74455029	46.171255
acidification	Pt	200.5427621	133.2209875	372.5189459	239.240287	154.9823378	454.489262
eutrophication	Pt	54.71865118	36.34971747	101.6428319	65.27737863	42.28736252	124.008661
carcinogens	Pt	48.63115972	32.30578382	90.33498974	58.01522073	37.58286135	110.2126033
winter smog	Pt	4.714841164	3.132079109	8.758070559	5.624635571	3.643697226	10.68522573
summer smog	Pt	3.342767039	2.220607321	6.209369217	3.987800594	2.583338561	7.57569961

CPD_5k_2.3_Avg	CPD_5k_2.3_High	CPD_5k_2.3_Low	CPD_5k_3.0_Avg	CPD_5k_3.0_High	CPD_5k_3.0_Low	MBD_5k_1.5_Avg	MBD_5k_1.5_High
460.5759772	292.9171469	888.9454034	588.4146406	365.2624259	1158.416436	381.3179172	250.452921
28.23551328	17.957224	54.49661073	36.07263561	22.39233609	71.01647564	23.3766146	15.35396358
277.9378119	176.7629119	536.4403542	355.0829523	220.4201792	699.0545437	230.1089783	151.1375762
75.83610609	48.23025283	146.3692447	96.88537249	60.14225981	190.7389792	62.78587563	41.23830862
67.39928175	42.86460061	130.0855552	86.1068013	53.45138778	169.5191231	55.80089933	36.6505155
6.534429979	4.155767302	12.61192894	8.348143322	5.182167253	16.43505407	5.409954824	3.553305332
4.632834149	2.946390234	8.941709568	5.918735618	3.67409575	11.65226041	3.835594464	2.519251769

MBD_5k_1.5_Low	MBD_5k_1.9_Avg	MBD_5k_1.9_High	MBD_5k_1.9_Low	MBD_5k_2.3_Avg	MBD_5k_2.3_High	MBD_5k_2.3_Low	MBD_5k_3.0_Avg
630.9744349	387.2750141	256.410018	636.9315318	393.2321111	262.3671149	642.8886288	403.6172106
38.68175484	23.74181318	15.71916215	39.04695341	24.10701175	16.08436072	39.41215199	24.74366809
380.7659594	233.7038304	154.7324283	384.3608114	237.2986824	158.3272803	387.9556635	243.5656437
103.8930525	63.76674102	42.21917401	104.8739179	64.74760641	43.20003941	105.8547833	66.45756426
92.3348716	56.6726427	37.52225887	93.20661497	57.54438608	38.39400225	94.07835834	59.06410982
8.95196117	5.494471245	3.637821753	9.03647759	5.578987665	3.722338173	9.120994011	5.726326451
6.346835385	3.895515614	2.579172919	6.406756535	3.955436764	2.639094069	6.466677685	4.059898234

MBD_5k_3.0_High	MBD_5k_3.0_Low
272.7522144	653.2737283
16.72101706	40.04880832
164.5942416	394.2226248
44.90999725	107.5647411
39.91372599	95.59808209
3.86967696	9.268332797
2.743555539	6.571139155

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:30:40 PM		
Project	Thesis_Dredging Limited LCA						

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Single score
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_20k_1.5_Avg	CPD_20k_1.5_High	CPD_20k_1.5_Low	CPD_20k_1.9_Avg	CPD_20k_1.9_High	CPD_20k_1.9_Low
Total	Pt	1097.316372	651.0756551	2237.319963	1353.885671	795.3839395	2780.594463
greenhouse	Pt	67.27074909	39.91405591	137.1584291	82.9996759	48.76084489	170.4637579
acidification	Pt	662.1832805	392.896182	1350.126463	817.0118278	479.980031	1677.96928
eutrophication	Pt	180.6785524	107.2028176	368.3857658	222.9239527	130.9638883	457.8385915
carcinogens	Pt	160.5779263	95.27642277	327.4025699	198.1234939	116.3940563	406.9037008
winter smog	Pt	15.56819581	9.237147594	31.74201731	19.20827736	11.28452398	39.44973407
summer smog	Pt	11.03766808	6.549029212	22.50471766	13.61844317	8.000595036	27.96939836

CPD_20k_2.3_Avg	CPD_20k_2.3_High	CPD_20k_2.3_Low	CPD_20k_3.0_Avg	CPD_20k_3.0_High	CPD_20k_3.0_Low	MBD_20k_1.5_Avg	MBD_20k_1.5_High
1610.423113	939.692224	3323.900818	2118.401017	1225.919583	4398.440055	1384.435703	860.9757183
98.72664979	57.60763388	203.7710396	129.8681282	75.15474183	269.6454412	84.87253918	52.78193507
971.8211513	567.0638799	2005.831321	1278.363989	739.7897922	2654.269579	835.4474594	519.5618511
265.1641078	154.724959	547.2966624	348.8051749	201.8537053	724.2248471	227.9541662	141.7638981
235.6643997	137.5116899	486.4094935	310.0003345	179.3973274	643.6542834	202.5940922	125.9925569
22.84790695	13.33190037	47.15790278	30.05485262	17.39275618	62.40294758	19.64170649	12.21510852
16.19889782	9.452160861	33.4343995	21.3085377	12.33125996	44.2429573	13.92573933	8.660368554

MBD_20k_1.5_Low	MBD_20k_1.9_Avg	MBD_20k_1.9_High	MBD_20k_1.9_Low	MBD_20k_2.3_Avg	MBD_20k_2.3_High	MBD_20k_2.3_Low
2383.061774	1408.264091	884.8041061	2406.890161	1432.060622	908.6006377	2430.686693
146.0931001	86.33333347	54.24272937	147.5538944	87.79217484	55.70157073	149.0127358
1438.075384	849.8268676	533.9412592	1452.454792	864.1870519	548.3014436	1466.814976
392.3828737	231.8776277	145.6873597	396.3063353	235.795844	149.605576	400.2245516
348.7299813	206.0810657	129.4795304	352.2169548	209.5633775	132.9618422	355.6992666
33.80973187	19.97977217	12.55317421	34.14779756	20.3173859	12.89078793	34.48541128
23.97070302	14.16542393	8.900053153	24.21038762	14.4047881	9.139417319	24.44975178

MBD_20k_3.0_Avg	MBD_20k_3.0_High	MBD_20k_3.0_Low
1473.696589	950.2366041	2472.32266
90.34465899	58.25405488	151.5652199
889.3125686	573.4269603	1491.940493
242.6514112	156.4611432	407.0801188
215.6562576	139.0547223	361.7921467
20.90809692	13.48149895	35.0761223
14.82359528	9.558224501	24.86855896

SimaPro 7.1	Impact assessment	Date:	8/13/2008	Time:	3:22:08 PM
Project	Thesis_Dredging Limited LCA				

Title:	Comparing product stages
Method:	Eco-indicator 95 V2.03 / Europe e
Indicator:	Single score
Skip categories:	With result = 0
Relative mode:	Non

Impact category	Unit	CPD_100k_1.5_Avg	CPD_100k_1.5_High	CPD_100k_1.5_Low	CPD_100k_1.9_Avg	CPD_100k_1.9_High
Total	Pt	5177.354374	2946.087076	10877.40418	6460.105299	3667.628498
greenhouse	Pt	317.3966195	180.6092477	666.8369726	396.0353947	224.8431926
acidification	Pt	3124.310901	1777.836961	6564.046039	3898.395966	2213.256206
eutrophication	Pt	852.4769311	485.0877664	1791.018244	1063.688197	603.8931201
carcinogens	Pt	757.6382257	431.1213844	1591.766105	945.3520781	536.7095523
winter smog	Pt	73.45380851	41.7976635	154.323368	91.65286039	52.03454544
summer smog	Pt	52.07788798	29.63405277	109.4134563	64.98080212	36.89188189

CPD_100k_1.9_Low	CPD_100k_2.3_Avg	CPD_100k_2.3_High	CPD_100k_2.3_Low	CPD_100k_3.0_Avg	CPD_100k_3.0_High	CPD_100k_3.0_Low
13593.77668	7742.824367	4389.16992	16310.18104	10278.47702	5815.942425	21678.54479
833.3636165	474.6722171	269.0771375	999.8922133	630.1198689	356.5451254	1328.998622
8203.260123	4672.461808	2648.675451	9842.49343	6202.61923	3509.67135	13082.07028
2238.282372	1274.894218	722.6984737	2685.551745	1692.401932	957.623603	3569.479312
1989.27176	1133.061269	642.2977202	2386.782076	1504.120933	851.0872506	3172.372031
192.8619517	109.8514603	62.27142737	231.4009875	145.826078	82.513788	307.564745
136.7368598	77.88339583	44.14971102	164.0605838	103.3889775	58.50130708	218.0597938

MBD_100k_1.5_Avg	MBD_100k_1.5_High	MBD_100k_1.5_Low	MBD_100k_1.9_Avg	MBD_100k_1.9_High	MBD_100k_1.9_Low	MBD_100k_2.3_Avg
6734.514032	4117.214109	11727.58067	6853.528547	4236.228624	11846.59519	6972.543061
412.8579643	252.4049438	718.9568632	420.1541241	259.7011036	726.253023	427.4502838
4063.989846	2484.561804	7077.091019	4135.809991	2556.38195	7148.911165	4207.630137
1108.870948	677.9196082	1931.003995	1128.467275	697.5159349	1950.600322	1148.063602
985.508214	602.5005374	1716.178336	1002.924435	619.916758	1733.594556	1020.340655
95.54603924	58.4130494	166.3852622	97.23455981	60.10156997	168.0737828	98.92308038
67.74102023	41.41416633	117.9651978	68.93816149	42.61130759	119.162339	70.13530275

MBD_100k_2.3_High	MBD_100k_2.3_Low	MBD_100k_3.0_Avg	MBD_100k_3.0_High	MBD_100k_3.0_Low
4355.243138	11965.6097	7180.818461	4563.518539	12173.8851
266.9972633	733.5491827	440.2185634	279.7655429	746.3174623
2628.202095	7220.73131	4333.315392	2753.88735	7346.416565
717.1122617	1970.196649	1182.357174	751.4058335	2004.490221
637.3329785	1751.010777	1050.819041	667.8113645	1781.489163
61.79009054	169.7623034	101.8779914	64.74500154	172.7172144
43.80844885	120.3594803	72.23029997	45.90344606	122.4544775

APPENDIX E

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August 16, 2008

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