Results of Completed Feasibility Study for New Large Dredge (“D3”) Project

INTRODUCTION

Sierra Rutile Limited (“SRL”) is a low-cost natural rutile mine located in the south west of Sierra Leone approximately 30 kilometres inland from the Atlantic Ocean. Sierra Rutile Limited holds mining licences over a land area of 580 square kilometres and the mining concession is one of the largest natural rutile deposits known in the world. At current production rates, the mine has a life in excess of 70 years, and thus project expansion initiatives such as D3 have been investigated.

The technical scope of the D3 Project comprised a new dredge, floating pipeline and floating treatment plant. Emergency power supply and ancillary support facilities and equipment were included for both the dredge and floating treatment plant.

Construction logistics including accommodation and messing facilities, construction equipment material, dry dock, earth works / civil preparation and laydown areas were also investigated.

The capital and operating cost estimates have been developed to a maximum ±10% level of accuracy.

The information for the major work streams of the D3 feasibility was obtained from the following sources:

<table>
<thead>
<tr>
<th>Work Stream</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dredge (lump-sum, turnkey tender submission)</td>
<td>Osbourne and Chappel International Limited</td>
</tr>
<tr>
<td>Floating Treatment Plant (preliminary designs, capital estimates and logistics)</td>
<td>CPG Mineral Technologies</td>
</tr>
<tr>
<td>Price forecasts for rutile, ilmenite and zircon</td>
<td>TZ Minerals International¹</td>
</tr>
<tr>
<td>Owners’ team costs and on-site support infrastructure requirements</td>
<td>Sierra Rutile</td>
</tr>
<tr>
<td>Coordination of the various technical disciplines and compilation of the cost and schedule estimates, and production of the study report to a definitive feasibility study level</td>
<td>Paradigm Project Management (Pty) Ltd</td>
</tr>
</tbody>
</table>

¹A $200/t premium to TZ Minerals International standard grade rutile price has been applied to industrial grade rutile production as TZ Minerals International does not provide a price for industrial grade rutile.
The key operational and financial metrics from the project are as follows.

<table>
<thead>
<tr>
<th>D3 Project</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Ore mined</td>
<td>187 million tonnes</td>
</tr>
<tr>
<td>Modeled mine life</td>
<td>27 years</td>
</tr>
<tr>
<td>Average annual production (first 10 years / LOM)</td>
<td></td>
</tr>
<tr>
<td>Rutile</td>
<td>81,000 tpa / 68,000 tpa</td>
</tr>
<tr>
<td>Ilmenite</td>
<td>43,000 tpa / 38,000 tpa</td>
</tr>
<tr>
<td>Zircon Concentrate</td>
<td>7,000 tpa / 5,200 tpa</td>
</tr>
<tr>
<td>Average operating costs (first 5 years / LOM)</td>
<td></td>
</tr>
<tr>
<td>Net of by-product credits</td>
<td>$219/tonne / $394/tonne</td>
</tr>
<tr>
<td>Capital cost</td>
<td>$169 million</td>
</tr>
<tr>
<td>Development &amp; construction period</td>
<td>24 months</td>
</tr>
</tbody>
</table>

| Financial metrics                   |       |
| Pre-tax NPV (10%)                   | $472 million |
| Post-tax NPV (10%)                  | $301 million |
| Pre-tax IRR                         | 68% |
| Post-tax IRR                        | 59% |
| Payback period                      | 12 months |

*Table 1: Key Operational and Financial Metrics*

**CURRENT OPERATIONS OVERVIEW AND NEW D3 FEED**

Sierra Rutile Limited currently utilises a bucket ladder dredge and conventional mineral processing methods in the Mining Area 1 to produce rutile, ilmenite and a zircon concentrate.

The dredge consisting of a continuous chain of buckets, rotating around a ladder (bucket ladder dredging), elevates the excavated ore from the pond into a drop chute where it is then transferred into a scrubbing and screening section located on the same pontoon. Product is pumped via a floating pipeline to the floating treatment plant, whilst oversize waste material is rejected back into the pond.

Bucket ladder dredging offers excellent excavation capability with a low rate of blockages under all ground conditions, while providing better ore recovery and clay handling for the SRL ore bodies than other dredging technologies.

The floating treatment plant consists of a separate floating pontoon which receives the -10mm product pumped from the dredge and then produces a 65% heavy mineral concentrate which is deposited on a stockpile on the shore.

A second mineral concentrate plant, fed by dry mining, is currently under construction, which will supply further heavy mineral concentrate to the feed preparation and dry plant. This infield concentration plant will be fed by conventional loading and hauling from resource areas that are not flooded, i.e. dry mining.

D3 would also supply additional heavy mineral concentrate to the dry plant, much as the existing dredge and the dry mining operation currently under construction do.
Heavy mineral concentrate produced from the various sources is then trucked through to the central Land Plant stockpile using front end loaders and 30-tonne dump trucks.

The central Land Plant comprises the Feed Preparation Plant and the Dry Plant. Feed preparation for dry processing involves surface cleaning of dirty or stained grains in attrition scrubbers, further gravity concentration on spirals from 65% to 96% heavy minerals, and removal of iron sulphides in a sulphide flotation circuit.

In the Dry Plant, high tension rolls separate rutile and ilmenite (conductors) from zircon and quartz (non-conductors). Induced roll magnets separate the rutile from ilmenite. This process is followed by cleaning of the non-magnetics on electrostatic plate separators to produce finished rutile product containing 95% to 96% TiO$_2$, plus ilmenite typically containing around 62% TiO$_2$.

The product streams produced are then transported through to Nitti Port by trucks and then out to ocean-going vessels via barges and push boats.

**MINERAL RESOURCE & RESERVE**

The Mineral Resource estimates were prepared in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves 2004 edition (the “JORC Code”), under the supervision of competent persons as defined in the code.

The mineral resource estimates represent an in-situ rutile cut-off grade of 0.8%.

The resource statement estimates the total measured, indicated and inferred resources at over 600 million tons at an average grade of 6.49% heavy minerals.
Figure 2: Mineral resources for Gangama and Sembehun

The resource data is based on the declared resources as at January 2011, and does not include any increased resources in Mining License area 1 which may result from the 2011 and 2012 exploration drilling program.

Insufficient data was available to publish a JORC-compliant grade for ilmenite for the Sembehun deposits. The production of ilmenite for Sembehun has been assumed to be based on a ratio of 0.6 tonnes of ilmenite per tonne of rutile. This ratio was derived from historic non-JORC compliant work.

Deposit Morphology and Lithology

Besides the heavy mineral grade data, details of the resource lithology and morphology were analysed from the drill hole data and used to prepare the geological model.

<table>
<thead>
<tr>
<th>Lithology</th>
<th>Lith. Code</th>
<th>% Comp</th>
<th>Ave. Depth</th>
<th>Ave. Thick</th>
<th>% Oversize</th>
<th>% Slimes</th>
<th>In-situ t/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil</td>
<td>TS</td>
<td>2.67</td>
<td>0.61</td>
<td>0.62</td>
<td>7.74</td>
<td>25.11</td>
<td>1.57</td>
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<tr>
<td>Lateritic gravel</td>
<td>LG</td>
<td>20.05</td>
<td>2.39</td>
<td>1.40</td>
<td>36.41</td>
<td>20.67</td>
<td>1.73</td>
</tr>
<tr>
<td>Blocky laterite</td>
<td>BL</td>
<td>2.14</td>
<td>3.83</td>
<td>1.38</td>
<td>42.74</td>
<td>35.82</td>
<td>1.67</td>
</tr>
<tr>
<td>Sandy / silty / stiff clay</td>
<td>SSC</td>
<td>7.62</td>
<td>1.83</td>
<td>1.15</td>
<td>28.01</td>
<td>27.80</td>
<td>1.60</td>
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<tr>
<td>Sandy / clayey sand</td>
<td>SCS</td>
<td>47.76</td>
<td>5.17</td>
<td>1.34</td>
<td>23.75</td>
<td>27.02</td>
<td>1.63</td>
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<tr>
<td>Clayey / sandy clay</td>
<td>CSC</td>
<td>18.68</td>
<td>6.00</td>
<td>1.27</td>
<td>10.97</td>
<td>39.48</td>
<td>1.65</td>
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<tr>
<td>Bedrock</td>
<td>BED</td>
<td>1.08</td>
<td>5.15</td>
<td>1.05</td>
<td>41.41</td>
<td>27.79</td>
<td>1.52</td>
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<tr>
<td>Total</td>
<td></td>
<td>100</td>
<td>4.36</td>
<td>1.30</td>
<td>25.46</td>
<td>29.83</td>
<td>1.65</td>
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</table>

Table 2: Gangama Deposit Morphology
<table>
<thead>
<tr>
<th>Lithology</th>
<th>Lith. Code</th>
<th>% Comp</th>
<th>Ave. Depth</th>
<th>Ave. Thick</th>
<th>% Oversiz</th>
<th>% Slimes</th>
<th>In-situ t/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil</td>
<td>TS</td>
<td>0.10</td>
<td>0.88</td>
<td>0.88</td>
<td>10.18</td>
<td>30.72</td>
<td>1.57</td>
</tr>
<tr>
<td>Lateritic gravel</td>
<td>LG</td>
<td>0.34</td>
<td>2.52</td>
<td>1.29</td>
<td>29.22</td>
<td>27.82</td>
<td>1.67</td>
</tr>
<tr>
<td>Blocky laterite</td>
<td>BL</td>
<td>16.95</td>
<td>4.85</td>
<td>1.33</td>
<td>45.94</td>
<td>23.99</td>
<td>1.73</td>
</tr>
<tr>
<td>Sandy / silty / stiff clay</td>
<td>SSC</td>
<td>7.75</td>
<td>6.63</td>
<td>1.30</td>
<td>13.24</td>
<td>43.55</td>
<td>1.66</td>
</tr>
<tr>
<td>Sandy / clayey sand</td>
<td>SCS</td>
<td>61.35</td>
<td>7.19</td>
<td>1.37</td>
<td>15.93</td>
<td>27.77</td>
<td>1.64</td>
</tr>
<tr>
<td>Clayey / sandy clay</td>
<td>CSC</td>
<td>9.08</td>
<td>7.97</td>
<td>1.35</td>
<td>15.42</td>
<td>28.34</td>
<td>1.60</td>
</tr>
<tr>
<td>Bedrock</td>
<td>BED</td>
<td>4.42</td>
<td>8.95</td>
<td>1.04</td>
<td>20.24</td>
<td>48.97</td>
<td>1.52</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>6.88</strong></td>
<td><strong>1.34</strong></td>
<td><strong>20.99</strong></td>
<td><strong>29.34</strong></td>
<td><strong>1.64</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Table 3: Sembehun Deposit Morphology*

**Geological Modelling**

The geological models were prepared using the *Minesight MS3D* mining software. The topographic and bedrock surfaces were constructed from Digital Terrain Maps (DTMs) based on the respective drill hole elevations. The extent of each ore body was constrained by a perimeter extended beyond the limit of the drill holes. The three-dimensional solid, formed by the intersection of this perimeter and the DTM surfaces, defined the volume of heavy mineral sediments to be modelled for each deposit.

Industry-standard block estimation techniques were used to interpolate grades into the model. Model cells were sized appropriately to provide a balance between representative geological and grade continuity and geostatistical volume variance.

The estimation of the mineral resource tonnes and grade was undertaken using a cut-off of 0.8% rutile and based on statistical evaluation of the sample data, current operational practices for dredge mining and processing, consideration of the lateral and vertical mineralisation distribution, the potential mining and extraction methodology and the reasonable prospects for eventual economic extraction.

The mineral resource has been classified and reported in the Indicated category based on drill hole spacing and sampling density, confidence in analytical data, established geological continuity and the level of confidence in the rutile and mineralogical grade continuity.

**Suitability for Dredging**

Mineral reserves in Gangama and Sembehun consist of large alluvial ore bodies formed by deposition of rutile bearing unconsolidated sediments in valleys. The deposits consist of lithologic zones of top soil, laterite, sand and clay with silty clay sand being the dominant lithology.

For a bucket line dredge operation, the main factor that determines suitability for dredging is the in situ shear strength of the ore. This is defined as the consistency and compactness or percentage cemented. The shear strength of the cohesionless materials (sand and gravel) is directly related to the relative density and is estimated by the Standard Penetration Test (SPT) and is expressed in compactness terms based on relative density. SPT tests were conducted in Gangama in 2010. The Mean SPT value was 15, with 93.6 percent of the deposit being at 30 or below. Only 3.1 percent of the material had SPT values greater than 50.

The table below indicates the lithologies in Mogbwema, Bamba, Belebu, Pejubu, and Lanti. All these areas were mined by the D1 bucket ladder dredge. There are no major lithology differences to indicate that Gangama and Sembehun will present more significant challenges than the other deposits.
### MINE PLANNING

The path of the dredge mining sequence has been guided by accessing the higher grade ore blocks as early as possible. Data therefore guided the following sequence:

- Commence in Gangama East once project commissioning and hand-over has been completed
- Move to Gangama West 2 years thereafter
- Move to the Sembehun group of deposits 3 years thereafter which includes the Benduma, Kamatipa, Dodo, Kibi and Komende deposits

Gangama East is separated from Gangama West by a dam (G1) which has been designed to allow the pond to be mined at two distinct levels, namely 13.72m (45ft) and 19.81m (65ft). This maximises the tonnage that can be dredged. Additional upland areas to the south of the deposit have been identified for dry mining and are not dealt with as part of this Feasibility Study.

Gangama West is situated to the north-west of Gangama East and will require a new dam (G2) to be constructed across the valley to a height of 12.8m (42ft). This will allow Gangama West to be mined to a pond level of 10.67m (35ft) and again maximise the recovery of the resource.

The Gangama resources shown in table 5, are less than the resource figures shown in Figure 2, as high lying areas inaccessible to dredging have been excluded, and will need to be mined by an alternate mining method.

### Table 5: Resource to Reserve Conversion for Gangama

<table>
<thead>
<tr>
<th>Deposit</th>
<th>Resource</th>
<th>Reserve</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ore tonnes</td>
<td>Rutile Grade</td>
</tr>
<tr>
<td>Total</td>
<td>37,413,970</td>
<td>1.78</td>
</tr>
<tr>
<td>Conversion</td>
<td>86.6%</td>
<td>79.3%</td>
</tr>
</tbody>
</table>
From the drainage channel the dredge will enter the Benduma deposit from the south west and will work its way up towards the Kamatipa deposit in the north east. This involves the construction of a series of dams and locks as depicted in figure 4. The greater majority of the rutile reserve (more than 75%) will be extracted from the Sembehun deposit.

<table>
<thead>
<tr>
<th>Deposit</th>
<th>Resource</th>
<th>Reserve</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ore Tonnes</td>
<td>Rutile Grade</td>
</tr>
<tr>
<td>Sembehun</td>
<td>151,558,000</td>
<td>1.43</td>
</tr>
<tr>
<td>Conversion</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Table 6: Resources and Reserves for Sembehun (only Benduma and Kamatipa)*
For the dredging operations at SRL surface water from rainfall run-off and natural drainage channels is impounded in reservoirs. These reservoirs, normally termed as ponds, are created by building earth-filled dams to an appropriate elevation to contain water at a controlled pond level.

Earth-filled dams are preferred because of:

- Simple design
- Low construction costs
- Abundant availability of lateritic gravels and clay in the mining area
- Ease of removal for eventual land reclamation and rehabilitation.

The mining pond level is governed by the crest level of the dam, which is equal to the required pond level plus a free board of 1.75 m to prevent over-topping and allow for normal settlement. A 0.6 m thickness of selected gravel for vehicular traffic is then added at the top. A typical cross-section of a small earth fill dam is shown in Figure 5.
D3 PROJECT SCOPE

The technical scope of the D3 Project feasibility study comprised the following work streams.

a) Dredge
   - Ore extraction via bucket ladder dredging
   - Primary ore treatment including scrubbing and screening
   - Floating pipeline connecting the dredge to the floating treatment plant
   - Emergency power supply
   - Ancillary support facilities including offices, workshop, stores, messing and ablutions

b) Floating Treatment Plant
   - De-sliming of the product pumped from the dredge
   - Primary concentration to produce a 65% heavy mineral concentrate
   - Disposal of all process waste streams
   - Heavy mineral concentrate de-watering and stockpiling on the shore
   - Emergency power supply
   - Ancillary support facilities including offices, workshop, stores, messing and ablutions

c) Supporting infrastructure
   - Bulk power supply and reticulation
   - Site facilities including permanent and transit accommodation, messing, workshops, medical facilities, warehousing and stores
   - Ancillary equipment including landing stage fuel handling and dispensing, landing stage fire control, wide area network communications and vehicles

d) Construction logistics
   - Contractor accommodation and messing facilities
   - Construction equipment material including vehicles, cranes, forklifts, scaffolding
   - Dry dock earth works and civil preparation for the construction ponds
   - Laydown areas

Figure 5: Design criteria for earth filled dam
DREDGE

The D3 dredge will operate at an average of 1,000 tonnes per hour with a maximum production capacity of 1,300 tonnes per hour.

Dredging operations will take place 24 hours per day for 365 days per annum at an overall utilisation of 80%. This gives a total operating time of 7,000 hours per annum which translates into a production rate of 7 million tonnes per annum.

The current D1 dredge is a bucket-ladder dredge. During the history of Sierra Rutile Limited there have been various attempts at using other dredging technologies, namely: bucket-wheel and cutter suction dredges, neither of which was successful.

Hence one of the immediate activities at the commencement of the feasibility study was the commissioning of a trade-off study into various dredging technologies to ascertain which would be the optimal approach for the D3 Project.

The conclusion of the trade-off study was that bucket ladder dredging technology was the most appropriate for the SRL ore bodies based on a number of criteria.

The original intention that an engineering, procurement and construction management (EPCM) model would be used for the feasibility study was altered in favour of a Lump Sum Turn Key (LSTK) approach to ensure a smooth transition from the feasibility study to execution phase and robust testing and validation of the execution costs. A move back to an EPCM model would likely significant reduce the cost of this component, which currently constitutes over $73 million (inc taxes & duties), 43% of the total $169 million capital expenditure.

The dredge supplier will be accountable for the naval design of the entire floating pontoon and will be required to demonstrate sign-off by a qualified naval architect.

The dredge will transfer mined slurry into a scrubbing and screening section located on the same pontoon. The -10mm product will be pumped via a floating pipeline to the floating treatment plant, whilst the +10mm fraction is rejected back into the pond.

The D3 dredge is a 0.68m³ bucket-ladder dredge with a maximum design digging rate of 1,300 tph. The ladder length is such that the dredge can mine to a depth of 18.3 m below pond level and 6.1m above pond level. The overall process flow for the dredge is shown in Figure 6.

The continuous chain of buckets rotating round the ladder elevates the excavated ore into a drop chute that connects with the diverter chute feeding the identical port and starboard primary scrubbers. The diverter chute design includes a pneumatically operated isolation mechanism to enable dredge mining operation to continue on half circuit if one primary scrubber is down for any reason.

The design allows for a clamshell arrangement over the bucket ladder to facilitate removal of large rocks from the buckets with minimum downtime. The dimensions of the open end of the bucket will be approximately 1.4 m x 1.1m and rocks near this size or bigger will be removed to prevent damage to the scrubber liners and lifter bars. The inlet to each primary scrubber will be at least the same size as the inlet to the current D1 primary scrubber (1.7m diameter) to reduce the risk of choking of the scrubber inlet by large rocks.

Process water is pumped into the drop chute and used for washing the ore in the scrubber to separate clay and sand particles. The scrubber is an autogenous mill with lifter bars to facilitate tumbling action and good scrubbing to liberate the sand particles. Good scrubbing is also facilitated by scrubber overflow discharge arrangement providing the retention time required. Each scrubber revolves around a centrally installed spray water pipe equipped with high pressure spray nozzles to help breakdown stiff clay. The trommel screen attached to the discharge end of the primary scrubber has two sections with 10mm and 200mm openings in sequence. This allows the -10mm fraction to gravitate through a launder to the dredge final product sump.
The -200mm +10mm size fraction constitutes the feed to the secondary scrubber. The +200mm oversize fraction is discharged into the pond at the back of the dredge.

Each primary scrubber has an associated secondary scrubber to constitute a two-stage scrubbing process. Secondary scrubber trommel undersize (-10mm) will also be directed to the dredge final product sump. Secondary scrubber trommel oversize (-200mm +10mm) will be screened on a 25mm aperture screen and gravel pump used to dispose of the screen undersize (-25mm fraction) to a distance behind the dredge equal to one dredge-length. The -200mm +25mm screen oversize will join the primary scrubber trommel +200mm oversize for dumping at the back of the dredge. Design allows for a screen by-pass system.

Dredge final product is pumped through a floating pipeline to the floating treatment plant. The floating pipeline has a maximum length of 600m. The design allows for the dredge final product sump to overflow into another sump and be pumped to dewatering cyclones in order to return cyclone underflow to the final product sump. The dewatering cyclone overflow is used as part of the dredge process water. This ensures achievement of good dredge process water balance.

**FLOATING TREATMENT PLANT**

The floating treatment plant consists of a separate floating pontoon which receives -10mm product pumped from the dredge and then produces a 65% heavy mineral concentrate which is deposited on a stockpile situated on the shore. The overall process flow on the floating treatment plant is shown in Figure 7.
The basic process steps consist of the following:

- Screening to remove the +2mm waste fraction
- Primary and secondary de-sliming to remove the -6S micron waste fraction
- Gravity concentration with six stages of spirals to produce a heavy mineral concentrate and a “light” waste fraction
- De-watering of the heavy mineral concentrate and deposition on a land stockpile
- Co-disposal of the three inert waste streams to the back of the pond

Various options for the floating treatment plant contracting strategy were considered and a “hybrid” EPCM approach was adopted. This meant that the owner’s project team developed the initial process pack, leveraging off the unique SRL process experience, which was then issued to an EPCM project house that had been selected through a tender process.

This approach meant that the process pack development took place in parallel with the EPCM procurement process, thereby providing a schedule benefit. This was attractive, noting that the work was on the critical path for the feasibility study completion.

An EPCM enquiry document based on the International Federation of Consulting Engineers (FIDIC) form of contract was issued to pre-qualified companies and based on the outcome of the adjudication process, CPG Mineral Technologies Pty Ltd of Australia (CPG) was then appointed to complete the study work.

An independent naval architect was appointed to review the preliminary design completed for the feasibility study and no concerns were identified.

The appointed EPCM company for the execution will be accountable for the naval design of the entire floating pontoon and will be required to demonstrate sign-off by a qualified naval architect.

**PRODUCT LOGISTICS**

The four product streams (industrial and standard grade rutile, ilmenite and zircon) produced by the land plant from all the sources of heavy mineral concentrate will be transported through to Nitti Port by trucks and then out to ocean-going vessels via barges and push boats. The only additional transport and storage upgrade that will be required is a new dome for zircon storage at Nitti Port, which is being addressed as part of the Land Plant Upgrade Project.
INFRASTRUCTURE

In most instances the existing infrastructure has been deemed adequate for the expansion associated with the D3 Project. There are however some exceptions as described below and in these instances, specific provisions have been included in the project scope and capital estimates.

Roadway and bridge construction to Sembehun

Overhead power line to Sembehun

The Gangama mining site will require office and workshop facilities for the operations and maintenance teams.

The additional senior staff that will be recruited for the operations and maintenance teams will require accommodation units and provision has been made for the construction of additional housing units as follows:

- Four new houses at the existing Mobimbi camp which will accommodate 12 people
- Six new houses at the existing Kpanguma camp which will accommodate 21 people

Additional equipment and facilities have also been included as follows:

- Land support equipment
- Vehicles
- Landing stage fuel facilities
- Extension to the mine-wide area communications network

The mine currently has a powerhouse with a maximum capacity output of 27.4kW. The current power draw is 9kW. There is therefore potential for expansion without a power upgrade, but due to other planned expansion projects, the cost of additional power generation has been allocated to each project. An amount of $6.9 million has been included in the D3 project estimate for power.

PRODUCTION PROFILE

The ramp up of production commences after both the dredge and floating treatment plant have been commissioned.

The annual heavy mineral production is shown in Figure 8 and the total heavy minerals extracted over the life of the D3 Project are summarised below:

- Standard Grade Rutile 1,652,939 tonnes
- Industrial Grade Rutile 213,995 tonnes
- Ilmenite 1,035,558 tonnes
- Zircon 143,738 tonnes
The total estimated capital expenditure that will be required for the D3 Project per major work stream is summarised in the table below with the associated level of contingency.

<table>
<thead>
<tr>
<th>Area</th>
<th>Total ($m)</th>
<th>Contingency ($m)</th>
<th>Contingency (%)</th>
<th>Total incl. Contingency ($m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dredge</td>
<td>66 575 000</td>
<td>3 329 000</td>
<td>5%</td>
<td>69 904 000</td>
</tr>
<tr>
<td>FTP</td>
<td>45 317 000</td>
<td>2 266 000</td>
<td>5%</td>
<td>47 583 000</td>
</tr>
<tr>
<td>General Infrastructure</td>
<td>32 362 000</td>
<td>3 236 000</td>
<td>10%</td>
<td>35 598 000</td>
</tr>
<tr>
<td>Owner’s Project Team</td>
<td>8 455 000</td>
<td>423 000</td>
<td>5%</td>
<td>8 878 000</td>
</tr>
<tr>
<td>Clearing, Taxes, Duty</td>
<td>6 575 000</td>
<td></td>
<td></td>
<td>6 575 000</td>
</tr>
<tr>
<td>Grand Total</td>
<td>159 284 000</td>
<td>9 254 000</td>
<td>6%</td>
<td>168 538 000</td>
</tr>
</tbody>
</table>

The capital estimates have been based on the following exchange rates where applicable:

- $1.00 = €0.8
- $1.00 = ZAR8.

A provision for escalation has not been included in the capital estimate and the financial model has been run in constant money terms.

The base date for the capital estimate is end-June 2012.
MINING COST ESTIMATE

<table>
<thead>
<tr>
<th>Category</th>
<th>D3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumables – Dredge</td>
<td>0.64 $/t Ore Mined</td>
</tr>
<tr>
<td>Consumables – FTP and Landing Stage</td>
<td>0.25 $/t Ore Mined</td>
</tr>
<tr>
<td>Transport, load and haul</td>
<td>0.31 $/t km HMC</td>
</tr>
<tr>
<td>Power and fuel</td>
<td>1.25 $/t Ore Mined</td>
</tr>
<tr>
<td>Labour</td>
<td>2,440,205 $ per annum</td>
</tr>
</tbody>
</table>

Table 8: Mining cost estimate

The operating costs for the first five years have been estimated as:
- $ 219 per ton of rutile net of by-products (zircon & ilmenite) credits

and over the entire life of the project as:
- $ 394 per tonne of rutile net of by-products (zircon & ilmenite) credits

FINANCIAL ANALYSIS

The overall project financials are based on the financial model and are as follows:
- Project pre-tax Net Present Value at 10 percent discount rate = $472 million
- Project post-tax Net Present Value at 10 percent discount rate = $301 million
- Project pre-tax Internal Rate of Return = 68%
- Project post-tax Internal Rate of Return = 59%
- Payback Period after project commissioning and handover = 12 months

SENSITIVITY ANALYSIS

The project is sensitive to various project parameters that include sales prices, exchange rates, capital costs and operating costs.

A static sensitivity analysis has been completed where one parameter is varied at a time to define the change to the Net Present Value. This analysis shows the project to be significantly sensitive to selling prices as illustrated in the diagram below.
PROJECT SCHEDULE

Key milestones extracted from the detailed execution schedule are as follows:

- Award dredge design and supply contract  
  Month 2
- Award floating treatment plant EPCM contract  
  Month 2
- Site construction activities commence  
  Month 5
- Construction complete  
  Month 21
- Commissioning complete  
  Month 24

![Figure 9: Valuation Sensitivity](image-url)