Mining In Elite: Dangerous (2021)

There are two types of mining. Core Mining and Surface Mining (including subsurface). It is possible to outfit a ship to do both but as they require different kit and manoeuvrability, it is usually best to use specialised craft for both.

What are the differences between Core and Surface Mining?

Core Mining:

- Free whole tonnes of mineral by blowing up the asteroid (generally 15-25).
- Asteroids are persistent in all instances, cross platform and over all play styles (open, solo etc). Once cracked they will stay that way until Thursday morning (UTC).
- They are governed by Hotspot availability and tile resource only.
- Mappable.
- Requires much less equipment but preferably a medium ship.

Surface Mining:

- Blast off fragments that need to be refined to make up a whole tonne.
- Massive variability on the number of fragments and tonnage per asteroid.
- Asteroids only persistent to individual CMDRs. If in wing, each CMDR will be able to mine the same asteroid.
- Once depleted it will refresh for that CMDR in 2 hours. Other CMDRs may still mine it.
- Governed by overlap, system reserve level and resource extraction site (RES)
- Mappable.
- Requires more equipment but possible in any ship. Meta is probably Imperial Cutter.
- Mining in RES requires strategies against piracy

Where Can I find Minerals?

Simple answer is any asteroid belt or planetary ring. You must use a Detailed Surface Scanner (DSS) to highlight the hotspots in any given area. Once done, these hotspots will show up every time you are in scanning mode and have a DSS installed. Most Minerals are present as either cores or surface deposits. Occasionally, like platinum or low-temperature diamonds, you might find them as both. Minerals are specific to ring and belt types (eg. metallic, metal-rich, icy or rocky) depending on their makeup. Here is a breakdown of where to find the most commonly looked for minerals. As can be seen, core mining produces much more valuable minerals than surface mining, however, the cores are rare and require more skill to extract than simpler surface mining.

Mineral	**Ring Type**	**Core Mining**	**Laser Mining**
Monazite	Metallic	Yes	No
Monazite	Metal-Rich	Yes	No
Monazite	Rocky	Yes	No
Musgravite	Rocky	Yes	No
Alexandrite	Rocky	Yes	No
Alexandrite	Icy	Yes	No
Grandidierite	Icy	Yes	No
Alexandrite	Metal-Rich	Yes	No
Benitoite	Rocky	Yes	No

Serendibite	Metallic	Yes	No
Serendibite	Metal-Rich	Yes	No
Serendibite	Rocky	Yes	No
Rhodplumsite	Metallic	Yes	No
Rhodplumsite	Metal-Rich	Yes	No
Void Opal	Icy	Yes	No
Low Temp Diamonds	Icy	Yes	Yes
Painite	Metallic	Yes	Yes
Painite	Metal-Rich	Yes	No
Platinum	Metallic	Yes	Yes
Platinum	Metal-Rich	Yes	No
Osmium	Metallic	No	Yes
Osmium	Metal-Rich	No	Yes

Bromellite	Icy	Yes	Yes
Palladium	Metallic	No	Yes
Gold	Metallic	No	Yes
Gold	Metal-Rich	No	Yes
Tritium	Icy	No	Yes
Silver	Metallic	No	Yes
Silver	Metal-Rich	No	Yes

What Equipment Do I Need?

There are certain pieces of equipment that are common to both core and surface mining. Then there are modules (and specifically hardpoints) that are specific to one but not the other. It is possible to outfit a ship capable of both but it is not recommended due to the combat requirements of surface mining and the agility needed in core mining. However, if you do wish to go down this path, the python can make a good compromise.

Core Mining Ships:

- Most ships are pretty good due to lack of required internals compared to surface miners. However, medium ships are more agile in the cracked rock than large ships
- Good visibility is important. This makes many people choose the Krait or AspX despite lack of cargo space.
- Best ship is probably the python due to available cargo space and manoeuvrability.

Surface Mining Ships:

Almost any ship can be a good surface miner as you need few internals and at the minimum a single mining laser (with a second hardpoint devoted to defence). However, some ships are better organised internally for the type of modules you need than others.

- Starter ship – The Adder is a great all round choice as is the Cobra Mk 3. You won't be able to stand and fight with these builds but you will be able to run away.
- Intermediate – Asp Explorer and the Python are both decent choices. Both Kraits can perform the task but the Python is better laid out internally.
- Advanced – The Imperial Cutter is the hands-down best ship for surface mining. The Anaconda comes very close however, both need huge wealth and engineering to make them work.

Equipment Common to all Mining:

- Detailed Surface Scanner – optional internal Size 1
- A-Rated Prospector Limpet Controller. Size 1 or 3 is sufficient.
- Collector Limpet Controller. You will want a minimum of two for core mining, to a maximum of one active limpet per MW of mining laser on surface miners (see surface mining build below).
- A-Rated Refinery. Size 2 is sufficient for focused mining but if you are collecting numerous minerals you will need more. Larger refineries also act as temporary cargo.
- Shield Generator. This can be smaller in core miners but you'll still need occasional protection from explosion and bumping asteroids. Surface mining in RES requires a decent shield capable of taking damage while you either flee or fight.
- Cargo Racks as many as you can fit and filled with as many limpets as you can buy.
- Decent Thrusters, Power Distributor and FSD drives with a decent range (not jump).

Equipment specific to Core Miners:

- Seismic Charge Launcher. Medium hardpoint, fixed. They carry 70 charges used to blow up asteroids and each rock takes a minimum of three charges so bring a 2nd if you can.
- Abrasion Blaster. Small hardpoint, fixed. Used to free surface chunks of material.
- A-Rated Pulse Wave Analyser. This will show up asteroids with high value internals. Vital but is random in what it classes as high value. Always follow up with prospector.
- Collector Limpet Controller. 3 active limpets will be sufficient but 6 is ideal.

- Fuel Scoop. Important if travelling large distances for your core site but if struggling for space there are plenty of decent sites within FSD range that could be used.

Equipment specific to Surface Miners:

- Mining Lasers (fixed). Ideally you want to solely use Medium (size 2) mining lasers if possible. A single laser for small ships, two for medium and three or four for large ships.
- Protective weaponry. This guide assumes mining in areas of piracy, thus you need to be able to hold your own. You can choose to run in which case engineered thrusters, or fight in which case shield boosters and fixed weapons.
- Collector Limpets. See below.
- Utility Mounts may be required for shield boosters / chaff if you wish to fight.
- Fuel Scoop is optional but can help you reach markets far away.

Let's talk limpets. Limpet controllers come in odd module sizes. Size 1 allows a single active limpet, Size 3 allows 2 active limpets, size 5 allows 3 active limpets and size 7 allows 4 active limpets. For prospector limpets you can get away with a size 1 or 3 as you'll want to wait to see the results of one before launching a second. Collector limpets however, you want plenty. As you'll be in a potential combat environment it is important to snap up the fragments you shoot as quickly as they come off the asteroid. To do this you'll want to aim for one active limpet per MW of mining laser. A single size-1 mining laser draws 1.5MW so you'll want 2 active collector limpets. 2 size-1 or a single size 2 mining laser draws 3MW, so 3 active limpets. Double Size-2 Mining lasers will require 6 active limpets etc. Therefore assigning at least one size-5 collector limpet controller will be necessary in most builds. A-rating the collector limpets is advisable for core mining for distance and longevity but for surface mining, D-rated are light, do the job just as well.

How Do I Mine?

So, now you've got your ship and kitted it out for mining and your carrying all the limpets you can stuff into your cargo racks, what do you do then?

Core Mining Process:

1) First work out which mineral you want to find. The best way to do this is to look on eddb.io for the latest commodity selling prices. If something is peaking, it will most likely be a core mineral.

2) Find a market for the haul. Eddb.io is again the place to look, though ed/tools can also be useful.

3) Now, find a decent hotspot – you can do this yourself using your DSS and then testing it out. Alternatively you can use a website such as edtools hotspot finder (https://edtools.cc/hotspot). Even better, There's a published list of the best scoring void opal sites – though for the benefit of the CMDRs who discovered them, please mine a minimum of 1000km from the nav signal. Try:

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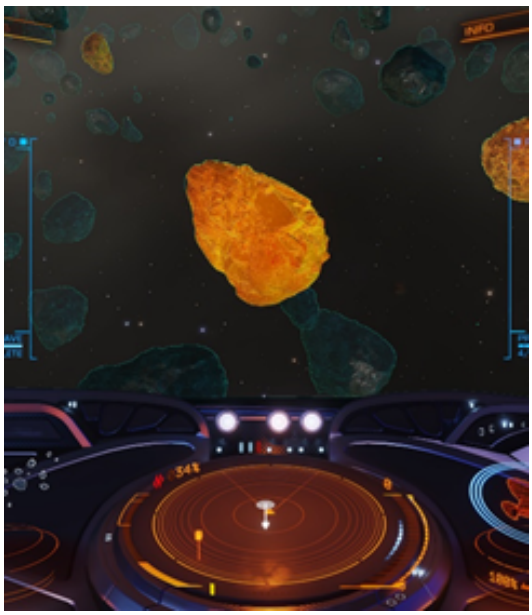
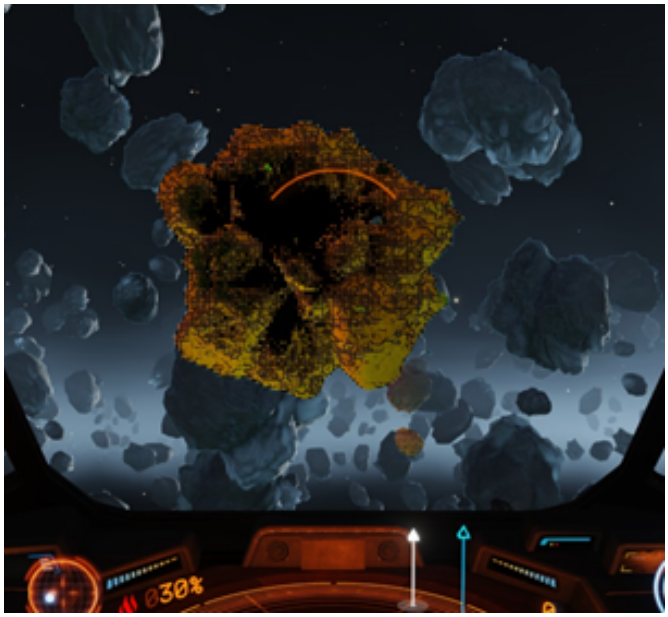
Tjindjin body A6

4) When you arrive and drop out of SC you'll be approached by pirates. Ignore them and they'll go away if you aren't carrying anything yet. If you are you're going to need to relog or run.

5) Once they've gone, glide above the ring using the external camera view while hitting your pulse wave scanner (PWS). If anything glows, get back in your ship and send off a prospector limpet. Core asteroids will glow brightly. When closer they can appear green and \ or black





6) Get to know your rocks. The shape of the core asteroids depends on the type of ring you are in. Ice rings have popcorn shapes (above right). In metallic rings they are teardrop-shaped (above left). In rocky ones they are balls. Metal-rich they look like squared off blocks.

7) If a rock does not have the shape for the type of ring it is guaranteed to **not** be a core. Even if it is the correct shape and it glows, it may still not be a core asteroid. There are two ways of making sure. A) firing a prospector limpet and B) getting up close and looking for fissures.

Images below courtesy of Smoke's Guide to Core Mining:

8) All core asteroid have fissures into which you will place the seismic charges. The lower left hand panel will tell you of their penetration capacity: Low, Medium and High.

9) Your seismic charge launcher can be set to launch a low, medium or high charge. This is done by keeping the trigger depressed while the little gauge next to the reticule rises past each stop mark (tap for low, 1-sec for medium, 2-sec for high) and then release. The rule of thumb is to match like with like (ie low fissure with low charge), but you'll get a feel for what is the right level.

10) Once the first charge has been set, a timer will begin at 120 seconds to lay all the other charges. Don't feel rushed, this is plenty of time. You can disarm charges in the

contacts panel if you overcharge but that fissure will then be unavailable for further charges.

11) A yield graph will appear in the upper right of the screen. At the bottom are five rows of yellow squares, above them are two rows of blue squares and at the top, two rows of red squares. Just select another fissure and fire the appropriate seismic charge at it. Keep doing that until the graph is hitting all the blue lights but no reds. That is optimal yield. Now turn tail and run about 1km away, turn around and wait for the fireworks.

12) A number of minerals will be released (each a tonne for the cargo racks). Head back in and release your collector limpets and open your cargo scoop.

13) While the limpets are collecting, you can use your abrasion blaster to grab the minerals that are still holding onto the inside of the cracked asteroid. Once blasted the collector limpets will get them.

14) Always try to keep your limpets in sight. If the asteroid comes between you and a limpet you may well lose that limpet – they are extraordinarily bad at pathfinding. Also note that minerals can get stuck inside the asteroid and limpets will throw themselves against it lemming-like. If this happens the best policy is to move close to other loose fragments and be quick about releasing new ones. Limpets will go after the closest option.

15) Bingo, you should now have between 15 and 20 tonnes of mineral in your hold.

Surface Mining Process:

The process for surface mining starts the same as for core mining but quickly diverts. It is a simpler and less skilled pastime, and the prices reflect this in general.

1) First work out which mineral you want to find. The best way to do this is to look on eddb.io for the latest commodity selling prices. If something is peaking, it will most likely be a core mineral. However, platinum and painite sell relatively well and some cores such as bromellite and Low Temperature diamonds can be laser mined as well as cored.

2) Find a market for the haul. Eddb.io is again the place to look, though ed/tools or Inara can also be useful.

3) Now, find a decent mining site. Unlike core asteroids that only depend on a single hotspot, surface mining relies on system reserve level, hotspot overlap and resource extraction site (RES). Explanations of these can be found in the *Mechanics of Surface Mining* section. For the first of these, a good rule of thumb is to only ever mine in systems with 'pristine' levels. For hotspots, the edtools hotspot finder is very useful. A double hotspot that overlaps will significantly boost your chance of finding rocks containing the named mineral. You should aim to drop into the cross-over area and not directly onto either hotspot location. However, bear in mind that finding a suitable RES within these overlaps is much rarer. There are a selection of very popular double platinum hotspot overlaps in the bubble which you should also visit.

System	Body / Ring	RES	Dist- Sol
HIP 59425	2A	L,M,Hi,Hz	258.22
Col 285 Sector KM-V d2-106	5A	M,Hi	180.40
Synuefe XU-N c23-19	1A	L,M,Hi,Hz	390.40

Omicron Capricorni B	B1	L,M,Hi,Hz	136.54

4) The last dependency is the Resource Extraction Site or RES. A RES is a shared mining area with added pirates. The higher the RES, the riskier mining will be but the higher the yield. If you are armed, a RES will provide quicker results than a hotspot overlap. When choosing a RES, make sure it is over a hotspot of the desired mineral.

5) In RES or out of RES you will encounter npcs on first dropping out of Supercruise. Often these will be pirates. If you have nothing in your cargo bay except limpets they will ignore you but if you are in a RES, they won't go very far and you may have to deal with them later.

6) When pirates attack – and they will if you are in a RES with nice shiny minerals on you – there are two options. The first is to boost away and keep boosting until the contact disappears. This is problematic for two reasons. a) when you return the pirate may still be there. They'll have forgotten about you, but only for now. And b) it is easy to get lost from where you last mined. This is especially a problem if you are map-mining (see later). The better option is to stand and fight. A wing or an npc fighter is very useful here so you are not too heavily distracted from your mining.

7) For mining outside a RES, the process is straight-forward. Set a distant target in your nav panel – the nearby planet is a good choice. This will help you travel in a straight line and not get turned around. Keep the solid compass point visible and you'll be fine.

8) Target any and all rocks with prospector limpets. Try one-at-a-time at first. With a 3A prospector controller you will only be able to keep 2 limpets active at any time.

9) The prospector will report on the composition of the rock in the bottom left panel. A rule of thumb is to ignore any rock that contains less than 20% mineral. The exact meaning of this report will be examined in greater depth in the next section.

10) If you find a rock worth mining, get up close to it. Really close. If it is spinning, try to find the fulcrum, or failing that, make sure it is spinning horizontally as much as possible. This will help protect your collector limpets.

11) There may be subsurface and surface deposits on the rock that can be mined with appropriate equipment. Abrasion Blasters are just point and click and provide 1t per shot. Displacement Missiles have their own mini game but is not worth the time.

12) Fire off as many collector limpets as you carry. A good tip is to bind your collector limpets with your mining laser so that you always have a full complement deployed whenever mining. Remember to open your cargo bay so the limpets have somewhere to put your minerals.

13) Put 4 pips into WEP on your distributor and keep your finger on the fire button for your laser until the asteroid reads ‘depleted.’ You may need to do this in stages if your distributor capacity drains to zero or you will encounter heat problems.

14) Once depleted, move away and target the next rock and repeat from stage 8) until you have no more limpets left.

15) For mining inside a RES, be aware that the zone only extends 20km. Pirates are more active within 10km, so the sweet spot is generally between 10 – 20km. You should take 2 points of reference before you start. The first is to keep the Hotspot targeted and always have it just in view on either your left or right. This will allow you to move around it at a decent distance. The other reference should be above or below you. Either a star, nebula or other visual clue. Keeping this reference point in the same place (ie. always above the ring) will help you maintain the same direction and not get turned around if pulled away to fight pirates.

16) Apart from this, stages 8) to 14) apply with the exception that you may not want to assign 4 pips to WEP if under attack.

17) It is not unusual to fill up your cargo bay and your refinery while you have limpets left. Don’t be afraid to jettison them. A few at a time depending on the size of your hold. You’re aiming to replace a cargo bay full of limpets with mineral plus a few more in your refinery.

Map Mining

Map mining is the process of using a map to find the best core or surface mining rocks. This is possible because each ring is persistent and split into tiles. Therefore, if a rock contains a core for one CMDR, it will contain a core for any other CMDR at any other time and in any play style (open, group, solo, Horizon or Odyssey). The only exception to this is if it has been depleted. Surface mining rocks are refreshed every 2 hours and only deplete per CMDR, so everyone else can still mine them. Core asteroids are refreshed every Thursday on the server tick. Once depleted, these are depleted for all CMDRs across all instances.

Using this knowledge, it is possible to carefully drop into a hotspot, find a starting location and then follow a map of the best rocks made by other CMDRs. These are usually posted in text and images showing rock placement, or sometimes via video on YouTube. Once you’re used to the route, map-mining can be extremely quick and lucrative.

1) Find a reputable map online (eg. Lalande 34968 by CMDR Churly) or create your own.

2) Each map starts with an orientation. Follow the instructions and then stick to that orientation. If you ever lose your way, just head back to the start and re-orient.

3) Take your time. It is much better to figure out the location of the next rock before you move than it is to try to find it again once you misplace it. You will get faster as you learn the route.

Mechanics of Laser Mining

Laser mining is dependent on getting a good level of frequency and value fragments per asteroid. These are all interlinked and depend on a great many calculations. We'll keep it as simple as possible. First we'll describe what each criteria affects and then go into the ultimate yields.

Hotspots

Hotspots in a ring raise the likelihood of any asteroid containing that specific mineral. It does not increase the chances of finding a good asteroid. This is an important distinction. For surface mining, all asteroids are counted as containing a certain amount of mineral – usually 1 to 3 types. Hotspots increase the likelihood of finding the specific mineral you want over the others. For core mining however, the number of asteroids containing cores does not increase, only the likelihood of finding a specific mineral in any given core asteroid. This effect lasts throughout the hotspot region. It is strongly debated whether double hotspot overlaps increase the effect over a single hotspot for core mining, from my experience I tend to think they don't.

Laser Surface Mining is more involved. While the presence of a hotspot does the same for increasing mineral frequency, double or triple overlapping hotspots do add further boosts. Not only does the chance of an asteroid containing a specific mineral increase (from around 10% with no hotspot to 96% in a triple overlap). Also the mineral content percentage within the asteroid increases by an average of 3% in non-hotspots to 25% in triple overlap hotspots.

	No Hotspot	Single Hotspot	Double Overlap	Triple Overlap
Chance of Mineral Presence	10%	26%	52%	96%
Base mineral %	+3%	+9%	+13%	+25%

		Data from CMDR SpanningTheBlack

System Reserve

The reserves in a system have no effect on core mining. However, for surface mining, the level of the system's reserve affects the Base Mineral %. Pristine reserves give full amounts while depleted systems limit the Base Mineral to 25% of full:

Reserve lvl	Depleted	Low	Common	Major	Pristine
Base Mineral adj	25%	50%	70%	85%	100%

Resource Extraction Sites

Resource Extraction Sites are known areas of good mining. They come in different levels of pirate aggravation but none are altogether safe. Core mining is unaffected by the presence of a RES, so it rarely makes it worthwhile to carry out core mining in a RES. Surface mining however is hugely dependent on the level of RES. It affects both the base mineral % and the total number of fragments. The calculations for these values will be looked at in further depth below. However, for now it is important to note that mining in a higher level RES can double the mineral yield of each asteroid.

(Data from CMDR Cold-n-Sour)	Base Mineral	Total Number of Fragments		
Type	Adj	Min	Max	Avg
No RES	75%	8	12	10
Low	82.5%	9	13	11

Regular (unlabelled)	90%	10	14	12
High	97.5%	11	16	13.5
Hazardous	105%	12	17	14.5

Prospector Limpets

The final criteria that makes up the calculation is the prospector limpet. Once again, these have little effect on core mining (except for subsurface deposits) but the level of prospector controller makes a big difference to surface mining, namely by increasing total number of fragments. It is therefore essential to use A-Rated prospector Controllers:

Prospector Rating	Total # Frags adj.	Avg # frags No RES	Avg # frags Haz RES
No prospector	100%	10	14.5
E	150%	15	21.75
D	200%	20	29
C	250%	25	36.25
B	300%	30	43.5
A	350%	35	50.75

How to Calculate Yield

Once you fire your prospector into an asteroid you'll see the following information on the lower left HUD:

Minerals Remaining %

Mineral %

Material Content

The final one is the easiest to deal with and one of the things that creates the most confusion. The Material Content has nothing to do with mining minerals. It is the likelihood of an asteroid fragment being an engineering raw material (iron, selenium, arsenic etc) instead of a mineral. For the sake of mining mechanics we can ignore this.

Minerals Remaining %

This is an important number for two reasons. 1) it lets you know when the asteroid is depleted and 2) it governs exactly how many fragments you receive from that asteroid. It uses data from the RES table (above) to give a percentage remaining based on the number of fragments. This can be worked out as 100/(100-PR) = NF where PR is the percentage of a single fragment and NF is the total number of fragments (calculated using A-Rated prospector controller)

	Mineral %	PR After 1 fragment blast		Total Number of Fragments (NF)
Type	Adj / yield(x)	Min Rem %	Frag %	(Min / Max)
No RES (Min)	75% / 0.26	96.43	3.57	28
No Res (Max)	75% / 0.26	97.62	2.38	42
Low (Min)	82.5% / 0.31	96.77	3.23	31
Low (Max)	82.5% / 0.31	97.78	2.22	45
Regular (Min)	90% / 0.38	97.14	2.86	35
Regular (Max)	90% / 0.38	97.96	2.04	49
High (Min)	97.5% / 0.46	97.37	2.63	38

High (Max)	97.5% / 0.46	98.21	1.79	56
Hazardous (Min)	105% / 0.53	97.62	2.38	42
Hazardous (Max)	105% / 0.53	98.31	1.69	59

The precise number of fragments is random each instance of the asteroid. Therefore, you could be in a wing with someone who also has an A-Rated Prospector limpet but receive a different number of fragments. However, these will always fall between the min and max for that RES.

Mineral %

This details how much of each mineral is in each asteroid. Asteroids are made up of 1 to 3 minerals and the percentages do not have to add to 100%. Fragments on the other hand only ever contain 2 minerals. The amount of mineral within each asteroid is constant and persistent and is calculated based on a base mineral % depending on the total number of minerals present in the asteroid (approx. 40%+ for 2 mineral asteroids, 30%+ for three mineral asteroids) This number is then adjusted by hotspot overlap and reserve level to give a range between 4% and 65% which is displayed in the HUD.

	Base Mineral % Adj pre-display	Base Mineral % post-display	Yield multiplier.
No Hotspots	+3%		
Single Hotspot	+9%		
Double Overlap	+13%		
Triple Overlap	+25%		
Depleted Reserves	-75%		

Low Reserves	-50%		
Common Reserves	-30%		
Major Reserves	-15%		
Pristine Reserves	+/- 0		
No RES		75% of mineral %	0.26
Low RES		82.5% of mineral %	0.31
Regular RES (no label)		90% of mineral %	0.38
High RES		97.5% of mineral %	0.46
Hazardous RES		105% of mineral %	0.53

However, the material % displayed in the HUD is not the tonnage you will receive. A Platinum 50% will not mean that every two fragments collected make up 1 tonne. There are further calculations to be made!

The type of RES will adjust this per fragment you collect when it hits the refinery. Therefore a fragment with a mineral content displaying 50%, will – in a non RES site – provide a yield of 0.375t (0.5x75%) while the same 50% mineral fragment in a Haz RES will provide a yield of 0.525t (0.5x105%).

This suggests that, using an A-Rated prospector limpet controller, you can multiply the displayed mineral % by the yield multiplier to determine how many tonnes per asteroid you will receive.

	Mineral %	Total # Fragments		Avg # Frag	Avg Yield
Type	Adj / yield(x)	Min	Max		(t)

No RES	75% / 0.26	28	42	35	9.1
Low RES	82.5% / 0.31	31	45	38	11.78
Regular RES	90% / 0.38	35	49	42	15.96
High RES	97.5% / 0.46	38	56	47	21.62
Hazardous RES	105% / 0.53	42	59	50.5	26.76

The difference is stark. An average rock in a non-RES gives an average yield of 9.1t of mineral. In a Hazardous RES the same asteroid yield is 26.76t. That’s nearly three times.