

Technical Memorandum



To: Vicky Peacey, Will Antone, Resolution Copper

From: Nate Tiplle, Tiplle Consulting

Date: October 25, 2022

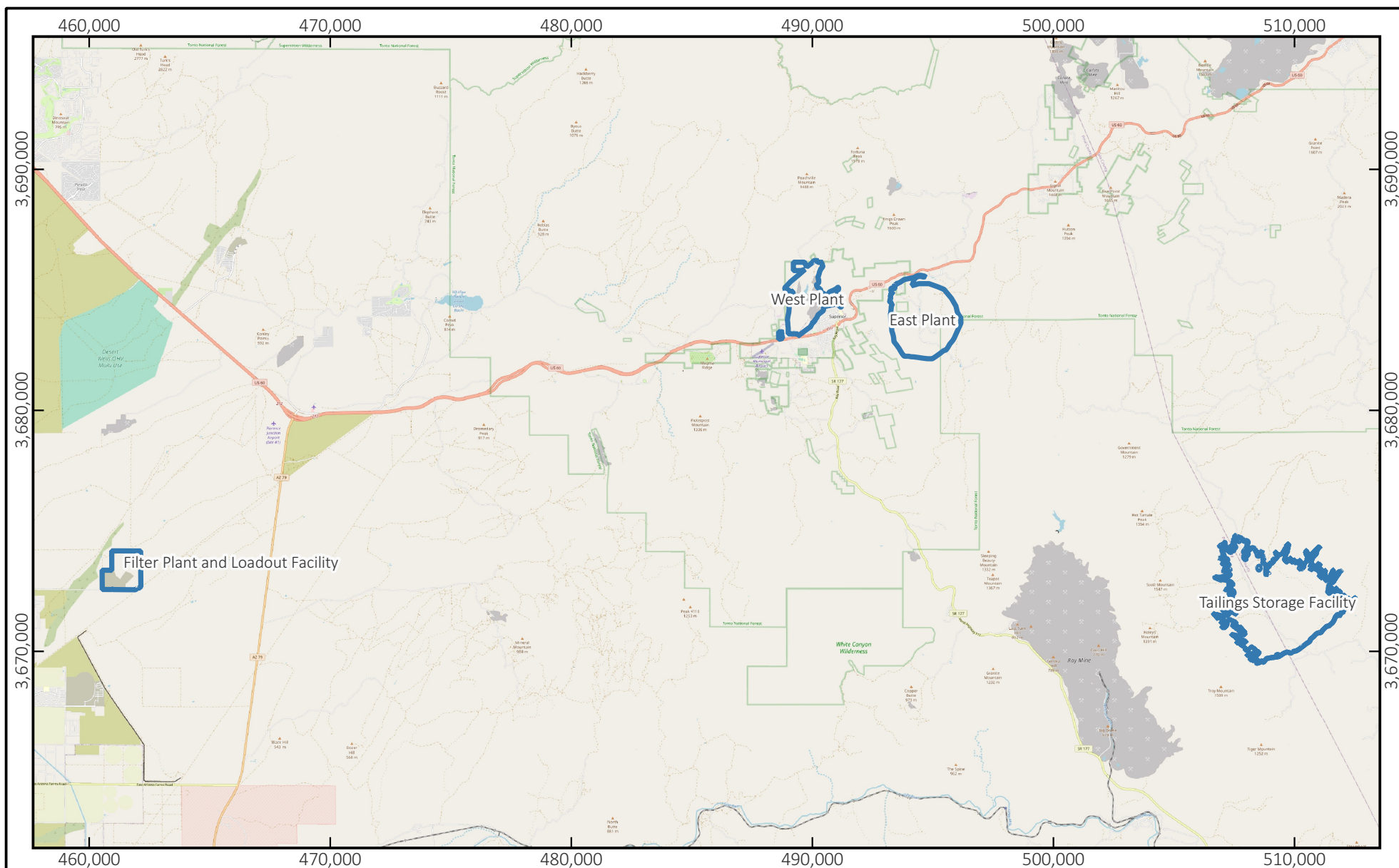
Scope 2 (Indirect) Greenhouse Gas Emissions from the Resolution Copper Project

Resolution Copper (Resolution), a subsidiary of Rio Tinto and BHP, is proposing to develop an underground copper mine near Superior, Arizona, approximately 60 miles east of Phoenix. The extent of the project area for the preferred alternative is shown in Figure 1.

All electricity required for all phases of this project is expected to be provided by the Salt River Project (SRP), the project's electrical utility. The Final Environmental Impact Statement (EIS) dated January 2021 provides an estimate of Scope 2 (indirect) GHG emissions associated with the generation of Resolution's electricity use for a single representative year (878,000 metric tonnes of GHGs for 2035) [1]. Previous versions of this memo quantify Scope 2 (indirect) carbon dioxide (CO₂) emissions for every year based on SRP's commitments to reduce GHG emissions. This updated memo quantifies Resolution's estimated Scope 2 (indirect) GHG emissions associated with Resolution's annual electricity use and accounts for the following GHGs: CO₂, methane (CH₄), and nitrous oxide (N₂O). Additionally, this version provides a discussion and the estimated impact of Rio Tinto's commitments on GHG emissions as well as a focus on Scope 2 emissions associated with electricity generation. This memo supersedes all previous versions, most recently, the Resolution GHG memo dated February 16, 2022.

Rio Tinto has made several public commitments in support of reducing its impact on climate change, including as one of the 14 original multinational supporters of the Paris Climate Agreement, a member of the International Council on Mining & Metals (ICMM), and corporately as a member of the international mining community through their sustainability and climate reports. These commitments include reducing global GHG emissions by 50% by 2030¹ and net-zero GHG emissions by 2050 [2]. "The net zero transition is at the heart of Rio Tinto's business strategy to combine investment in commodities

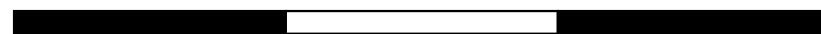
¹ Relative to the 2018 equity emissions baseline



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Figure 1
Resolution Copper Project Location

0 5 10 15 mi



NAD83 UTM Zone 12N

Version 11/2022



that enable the energy transition with actions to decarbonize operations and value chains across the globe [3].”

Scope 2 emissions are referred to as emissions that “are indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling. Although scope 2 emissions physically occur at the facility where they are generated, they are accounted for in an organization’s GHG inventory because they are a result of the organization’s energy use [4].”

Assumptions for Calculations

Resolution’s Scope 2 GHG emissions are associated with the electricity generated and delivered by SRP. The electricity demand for this analysis is based on the Skunk Camp preferred alternative.

SRP Commitments

To quantify GHG emissions, emission factors on a year-by-year basis were generated using SRP’s Retail Total Carbon Intensities. SRP carbon intensity goals include a 65% reduction from 2005 levels by 2035 and a 90% reduction by 2050 [5]. Table 1 provides SRP’s existing and anticipated carbon intensities in pounds per Megawatt hour (lb/MWh) and reductions.

Table 1. SRP’s Carbon Intensities by Year

Year	Carbon (CO ₂) Intensity lb/MWh	Reduction
2005	1,576	0%
2018	1,328	16%
2019	1,119	29%
2020	934	41%
2021	922	41%
2035*	550	65%
2050*	158	90%

**Represents future goals rather than historic intensities*

To be conservative, no interpolation was used to account for years between the years shown in Table 1. Instead, a stepwise approach for goal years was used. For example, the carbon intensity for 2049 is assumed to be the same as the carbon intensity for 2035. Scope 2 GHG intensities can be calculated annually when SRP releases carbon intensity data.

SRP’s carbon intensities account for CO₂ but not CH₄ or N₂O. To account for these emissions, the emission factor for Arizona from EPA’s Emission Factors for Greenhouse Gas Inventories was scaled by SRP’s carbon intensities on a year-by-year basis [6].

Rio Tinto Commitments

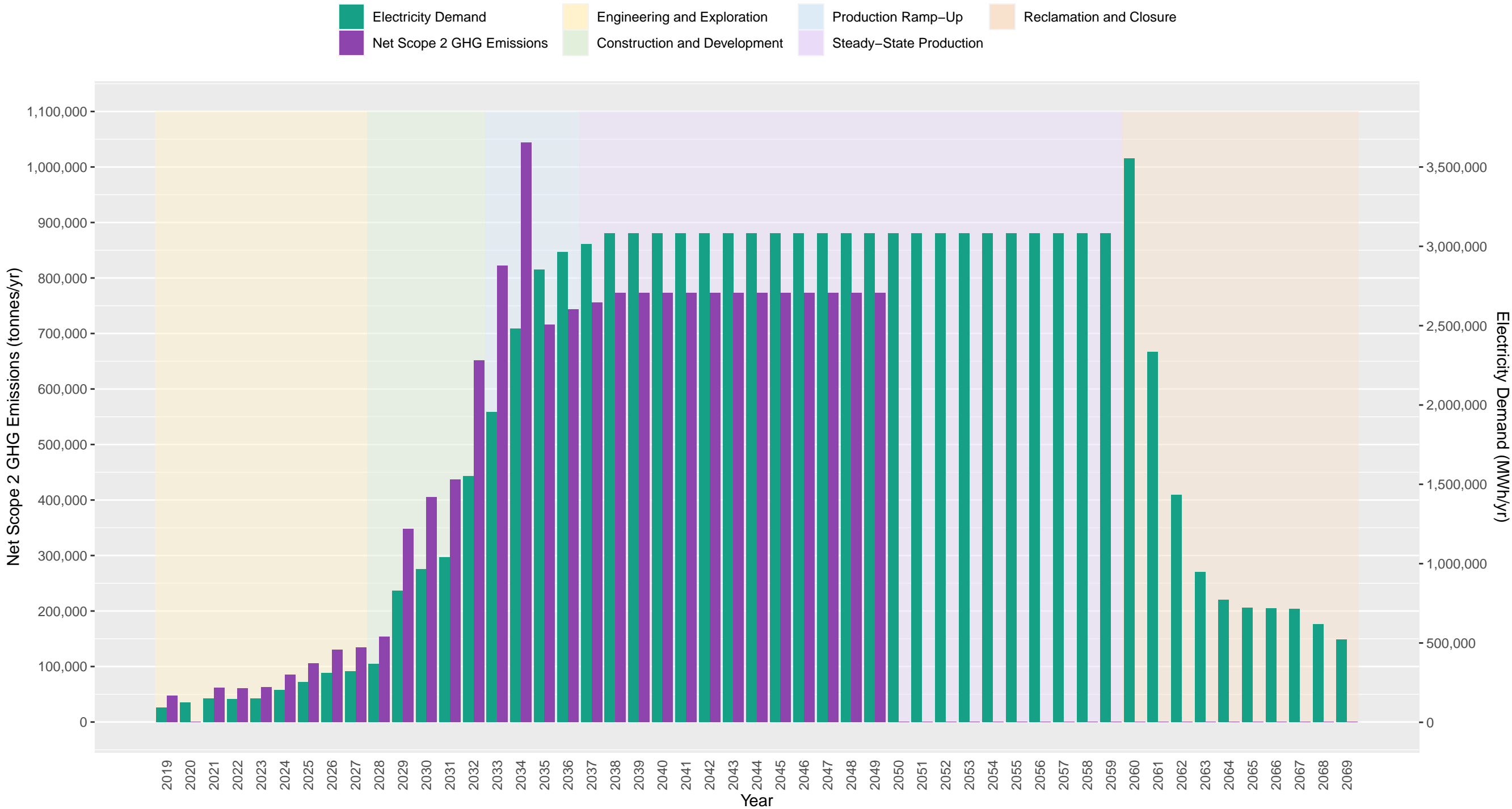
Beyond SRP’s carbon intensity goals, Rio Tinto has committed to being net zero by 2050, including for all Scope 2 GHG emissions. “[Rio Tinto has] the outline of a broad pathway to net zero...we are investing in research and development of many different low-carbon technologies across our carbon footprint [2].”

To account for this net zero commitment in this analysis, the Scope 2 GHG emissions will be assumed to be zero beginning in 2050. Resolution's 2050 commitment would be achieved by agreements with SRP for additional renewable power needed to achieve the full 100% renewable line power to the project, similar to the existing agreement between Resolution and SRP for the current line power.

Results of GHG Calculations

Given the assumptions discussed above, a year-by-year graphical representation of the electricity demand and associated Scope 2 GHG emissions are provided in Figure 2. A tabular version of GHG emissions data is provided electronically.

Figure 2. Net Scope 2 GHG Emissions and Electricity Demand by Year



References

- [1] United States Department of Agriculture, "Final Environmental Impact Statement, Resolution Copper Project and Land Exchange," 2021.
- [2] Rio Tinto, "Our Approach to Climate Change," 2021.
- [3] Resolution Copper, "Rio Tinto Climate Change & Clean Energy," 2022.
- [4] EPA, "Scope 1 and Scope 2 Inventory Guidance," [Online]. Available: <https://www.epa.gov/climateleadership/scope-1-and-scope-2-inventory-guidance>. [Accessed 10 2022].
- [5] SRP, "Sustainability at SRP," [Online]. Available: <https://www.srpnet.com/grid-water-management/sustainability-environment/sustainability-overview>. [Accessed 10 2022].
- [6] EPA, "Emission Factors for Greenhouse Gas Inventories," 2018.

Scope 2 (Indirect) CO₂ Emissions

Year	Electricity Demand	Indirect CO ₂ e Emissions	Project Phase
	<i>MWh/yr</i>	<i>tonne/yr</i>	
2019	92,442	47,170	Engineering and Exploration
2020	122,867	0	
2021	146,859	61,745	
2022	145,524	61,184	
2023	150,031	63,079	
2024	203,393	85,514	Construction and Development
2025	252,275	106,066	
2026	310,668	130,617	
2027	319,735	134,428	
2028	366,364	154,033	
2029	827,770	348,025	Production Ramp-Up
2030	964,735	405,610	
2031	1,040,238	437,355	
2032	1,549,585	651,503	
2033	1,954,987	821,949	Steady-State Production
2034	2,482,624	1,043,787	
2035	2,852,966	715,533	
2036	2,964,265	743,447	
2037	3,012,921	755,650	
2038	3,083,001	773,226	
2039	3,083,001	773,226	
2040	3,083,001	773,226	
2041	3,083,001	773,226	
2042	3,083,001	773,226	
2043	3,083,001	773,226	
2044	3,083,001	773,226	
2045	3,083,001	773,226	
2046	3,083,001	773,226	
2047	3,083,001	773,226	
2048	3,083,001	773,226	
2049	3,083,001	773,226	
2050	3,083,001	0	
2051	3,083,001	0	
2052	3,083,001	0	
2053	3,083,001	0	
2054	3,083,001	0	
2055	3,083,001	0	
2056	3,083,001	0	
2057	3,083,001	0	

2058	3,083,001	0	
2059	3,083,001	0	
2060	3,555,141	0	
2061	2,333,777	0	
2062	1,433,345	0	
2063	947,011	0	
2064	769,636	0	
2065	722,129	0	Reclamation and Closure
2066	715,638	0	
2067	715,259	0	
2068	617,312	0	
2069	519,375	0	

132ktpd			
Year	WP + EP (kw)	TSF (kw)	Total (kw)
2019	10,731	0	10,731
2019	10,731	0	10,731
2019	11,328	0	11,328
2019	13,092	0	13,092
2020	14,780	0	14,780
2020	14,780	0	14,780
2020	14,830	0	14,830
2020	16,594	0	16,594
2021	16,559	0	16,559
2021	18,777	0	18,777
2021	18,777	0	18,777
2021	18,777	0	18,777
2022	17,713	0	17,713
2022	17,713	0	17,713
2022	17,713	0	17,713
2022	19,090	0	19,090
2023	19,008	0	19,008
2023	18,525	0	18,525
2023	18,525	0	18,525
2023	18,408	0	18,408
2024	19,620	0	19,620
2024	27,110	0	27,110
2024	27,110	0	27,110
2024	27,110	0	27,110
2025	28,610	0	28,610
2025	30,577	0	30,577
2025	32,551	0	32,551
2025	33,473	0	33,473
2026	38,173	0	38,173
2026	38,673	0	38,673
2026	38,673	0	38,673
2026	38,673	0	38,673
2027	39,673	0	39,673
2027	39,673	0	39,673
2027	39,673	0	39,673
2027	39,673	0	39,673
2028	42,173	0	42,173
2028	42,173	0	42,173
2028	42,173	0	42,173
2028	55,316	0	55,316
2029	78,456	16,038	94,494

132ktpd					
Year	MWh/y	kw	tonne/yr	RECs Purchased?	Notes
2019	92,442	11,470	47,170	No	*Updated EF to SRP 2019
2020	122,867	15,246	0	Yes	*Updated EF to SRP 2020
2021	146,859	18,223	61,745	No	*Updated EF to SRP 2021
2022	145,524	18,057	61,184	No	
2023	150,031	18,616	63,079	No	
2024	203,393	25,237	85,514	No	
2025	252,275	31,303	106,066	No	
2026	310,668	38,548	130,617	No	
2027	319,735	39,673	134,428	No	
2028	366,364	45,459	154,033	No	
2029	827,770	94,494	348,025	No	*Switch from 92% availability to 100% availability
2030	964,735	110,130	405,610	No	
2031	1,040,238	118,749	437,355	No	
2032	1,549,585	176,893	651,503	No	
2033	1,954,987	223,172	821,949	No	
2034	2,482,624	283,405	1,043,787	No	
2035	2,852,966	325,681	715,533	No	*Updated EF to 65%
2036	2,964,265	338,386	743,447	No	
2037	3,012,921	343,941	755,650	No	
2038	3,083,001	351,941	773,226	No	
2039	3,083,001	351,941	773,226	No	
2040	3,083,001	351,941	773,226	No	
2041	3,083,001	351,941	773,226	No	
2042	3,083,001	351,941	773,226	No	
2043	3,083,001	351,941	773,226	No	
2044	3,083,001	351,941	773,226	No	
2045	3,083,001	351,941	773,226	No	
2046	3,083,001	351,941	773,226	No	
2047	3,083,001	351,941	773,226	No	
2048	3,083,001	351,941	773,226	No	
2049	3,083,001	351,941	773,226	No	
2050	3,083,001	351,941	0	No	*Updated EF to 100%
2051	3,083,001	351,941	0	No	
2052	3,083,001	351,941	0	No	
2053	3,083,001	351,941	0	No	
2054	3,083,001	351,941	0	No	
2055	3,083,001	351,941	0	No	
2056	3,083,001	351,941	0	No	
2057	3,083,001	351,941	0	No	
2058	3,083,001	351,941	0	No	
2059	3,083,001	351,941	0	No	

2030	88,445	21,684	110,130	2060	3,555,141	405,838	0	No
2031	94,531	24,218	118,749	2061	2,333,777	266,413	0	No
2032	130,049	46,844	176,893	2062	1,433,345	163,624	0	No
2033	158,201	64,971	223,172	2063	947,011	108,106	0	No
2034	197,322	86,082	283,405	2064	769,636	87,858	0	No
2035	222,827	102,854	325,681	2065	722,129	82,435	0	No
2036	233,022	105,364	338,386	2066	715,638	81,694	0	No
2037	238,309	105,631	343,941	2067	715,259	81,651	0	No
2038	246,309	105,631	351,941	2068	617,312	70,469	0	No
2039	246,309	105,631	351,941	2069	519,375	59,289	0	No
2040	246,309	105,631	351,941					
2041	246,309	105,631	351,941					
2042	246,309	105,631	351,941					
2043	246,309	105,631	351,941					
2044	246,309	105,631	351,941					
2045	246,309	105,631	351,941					
2046	246,309	105,631	351,941					
2047	246,309	105,631	351,941					
2048	246,309	105,631	351,941					
2049	246,309	105,631	351,941					
2050	246,309	105,631	351,941					
2051	246,309	105,631	351,941					
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2054	246,309	105,631	351,941					
2055	246,309	105,631	351,941					
2056	246,309	105,631	351,941					
2057	246,309	105,631	351,941					
2058	246,309	105,631	351,941					
2059	246,309	105,631	351,941					
2060	270,319	135,519	405,838					
2061	177,178	89,235	266,413					
2062	108,419	55,205	163,624					
2063	71,241	36,865	108,106					
2064	57,673	30,185	87,858					
2065	54,036	28,399	82,435					
2066	53,539	28,155	81,694					
2067	53,510	28,140	81,651					
2068	51,709	18,760	70,469					
2069	49,909	9,380	59,289					

Year	CO ₂ e tonne/MWh	N ₂ O lb/MWh	CH ₄ lb/MWh	Carbon Intensity lb/MWh	Reduction
2005	0.719	0.018	0.119	1,576	0%
2018	0.606	0.015	0.101	1,328	16%
2019	0.510	0.013	0.085	1,119	29%
2020	0.426	0.011	0.071	934	41%
2021	0.420	0.011	0.070	922	41%
2022	0.420	0.011	0.070	922	41%
2023	0.420	0.011	0.070	922	41%
2024	0.420	0.011	0.070	922	41%
2025	0.420	0.011	0.070	922	41%
2026	0.420	0.011	0.070	922	41%
2027	0.420	0.011	0.070	922	41%
2028	0.420	0.011	0.070	922	41%
2029	0.420	0.011	0.070	922	41%
2030	0.420	0.011	0.070	922	41%
2031	0.420	0.011	0.070	922	41%
2032	0.420	0.011	0.070	922	41%
2033	0.420	0.011	0.070	922	41%
2034	0.420	0.011	0.070	922	41%
2035	0.251	0.006	0.042	550	65%
2036	0.251	0.006	0.042	550	65%
2037	0.251	0.006	0.042	550	65%
2038	0.251	0.006	0.042	550	65%
2039	0.251	0.006	0.042	550	65%
2040	0.251	0.006	0.042	550	65%
2041	0.251	0.006	0.042	550	65%
2042	0.251	0.006	0.042	550	65%
2043	0.251	0.006	0.042	550	65%
2044	0.251	0.006	0.042	550	65%
2045	0.251	0.006	0.042	550	65%
2046	0.251	0.006	0.042	550	65%
2047	0.251	0.006	0.042	550	65%
2048	0.251	0.006	0.042	550	65%
2049	0.251	0.006	0.042	550	65%
2050	0.000	0.000	0.000	0	100%
2051	0.000	0.000	0.000	0	100%
2052	0.000	0.000	0.000	0	100%
2053	0.000	0.000	0.000	0	100%
2054	0.000	0.000	0.000	0	100%
2055	0.000	0.000	0.000	0	100%
2056	0.000	0.000	0.000	0	100%
2057	0.000	0.000	0.000	0	100%
2058	0.000	0.000	0.000	0	100%
2059	0.000	0.000	0.000	0	100%
2060	0.000	0.000	0.000	0	100%
2061	0.000	0.000	0.000	0	100%

2062	0.000	0.000	0.000	0	100%
2063	0.000	0.000	0.000	0	100%
2064	0.000	0.000	0.000	0	100%
2065	0.000	0.000	0.000	0	100%
2066	0.000	0.000	0.000	0	100%
2067	0.000	0.000	0.000	0	100%
2068	0.000	0.000	0.000	0	100%
2069	0.000	0.000	0.000	0	100%

October 25, 2022

Mr. Cory Brunsting
US Forest Service
Supervisor's Office
2324 East McDowell Road
Phoenix, AZ, 85006-2496

**Subject: Resolution Copper Mining, LLC – Mine Plan of Operations and Land Exchange –
List of Potential Final EIS Changes Prior to Republication/Response to EPA
Scoping Comments**

Dear Mr. Brunsting,

In response to USFS Action Item RP18 please find the Resolution Copper responses regarding reductions (or mitigations) to indirect greenhouse gas (GHG) emissions associated with the project below.

Resolution Copper Response: Please see the attached memo titled “*Scope 2 (Indirect) Greenhouse Gas Emissions from the Resolution Copper Project*” dated October 25, 2022, which describes Resolution Copper’s commitment to mitigate GHG emissions in line with Rio Tinto public commitments via renewable electricity purchased from project electricity provider, Salt River Project (SRP). SRP has committed to add 2,025 megawatts (MW) of renewable solar energy to the grid by 2025 and will reduce the amount of CO2 emitted per megawatt-hour by 65% by 2035 and 90% by 2050. Rio Tinto, the operator of the Resolution Copper Project, has made a public commitment to reduce global GHG emissions by 50% by 2030 and 100% or net-zero GHG emissions by 2050. This memo provides a discussion and revised Scope 2 (indirect) GHG emission calculations consistent with Rio Tinto and SRP’s public commitments.

Of note, the revised Scope 2 (indirect) GHG emission calculations from October 2022 are directly responsive to US Environmental Protection Agency (EPA) scoping comments titled “Resolution Copper Project General Plan of Operations and associated Land Exchange EPA Scoping Comments – July 18, 2016”.

EPA Comments:

- *The EPA recommends that the Draft EIS estimate the direct and indirect GHG emissions caused by the proposal and its alternatives.*
- *The EPA recommends that the Draft EIS describe measures to reduce GHG emissions associated with the project, including reasonable alternatives and other practicable*

mitigation opportunities, and disclose the estimated GHG reductions. For example, we recommend considering the following potential measures for your consideration:

- *Use conveyors rather than haul trucks where possible, e.g., for transporting ore to processing areas and the heap leach facility – **RC Response: The project incorporates use of conveyors to move ore from underground to the concentrator at surface;***
- *Incorporate alternative energy components into the project, such as on-site solar and/or geothermal power generation – **RC Response: Per the revised Scope 2 (indirect) GHG emission calculations (October 2022), all energy components from line power will be comprised of renewables and a large component will come from solar;***
- *Offer ride sharing or shuttle options for mine employees commuting to the site from both nearby and distant communities;*
- *Commit to using high efficiency diesel particulate filters on new and existing diesel engines to reduce of black carbon emissions – **RC Response: As stated in the EIS, Resolution has committed to the use of Tier 4 diesel engines (or greater), dramatically reducing harmful emissions. Further, Resolution will consider additional diesel particulate filters on older engines, if applicable.***
- *EPA further recommends that the Record of Decision commit to implementation of reasonable mitigation measures that would reduce project-related GHG emissions and improve environmental resilience to climate change impacts.*

Should you have any questions or require further information, please contact me.

Sincerely,



Willard Antone III,
Senior Manager, Permitting and Approvals; Resolution Copper Company, as Manager of Resolution Copper Mining, LLC

Cc: Karlene Martorana; Resolution Copper Mining Company, LLC

Enclosure(s): Technical Memorandum – Scope 2 (Indirect) Greenhouse Gas Emissions from the Resolution Copper Project