

Supplementary information for

Substrate competition over 320 days maintains extracellular electron transfer and parallel genomic evolution in *Shewanella oneidensis* MR-1

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Table 1

Figures 1 to 15

Data 1

Supplementary Table 1 Experiment groups and treatments in the long-term cultivation

| Culture system | Electron acceptor | Strain | Treatment group | Sample name |
|-----------------------|--------------------------|--|------------------------|--|
| Anaerobic control | None | <i>S. oneidensis</i> MR-1 | MR-1 | Anaerobic control-MR-1_1, 2, 3 |
| | | <i>C. freundii</i> An1 | An1 | Anaerobic control-An1_1, 2, 3 |
| | | <i>S. oneidensis</i> MR-1 and <i>C. freundii</i> An1 | Mix | Anaerobic control-Mix-MR-1_1, 2, 3 & Anaerobic control-Mix-An1_1, 2, 3 |
| Oxygen | Oxygen | <i>S. oneidensis</i> MR-1 | MR-1 | Oxygen-MR-1_1, 2, 3 |
| | | <i>C. freundii</i> An1 | An1 | Oxygen-An1_1, 2, 3 |
| | | <i>S. oneidensis</i> MR-1 and <i>C. freundii</i> An1 | Mix | Oxygen-Mix-MR-1_1, 2, 3 & Oxygen-Mix-An1_1, 2, 3 |
| Ferrihydrite | Ferrihydrite | <i>S. oneidensis</i> MR-1 | MR-1 | Ferrihydrite-MR-1_1, 2, 3 |
| | | <i>C. freundii</i> An1 | An1 | Ferrihydrite-An1_1, 2, 3 |
| | | <i>S. oneidensis</i> MR-1 and <i>C. freundii</i> An1 | Mix | Ferrihydrite-Mix-MR-1_1, 2, 3 & Ferrihydrite-Mix-An1_1, 2, 3 |

Supplemental figures

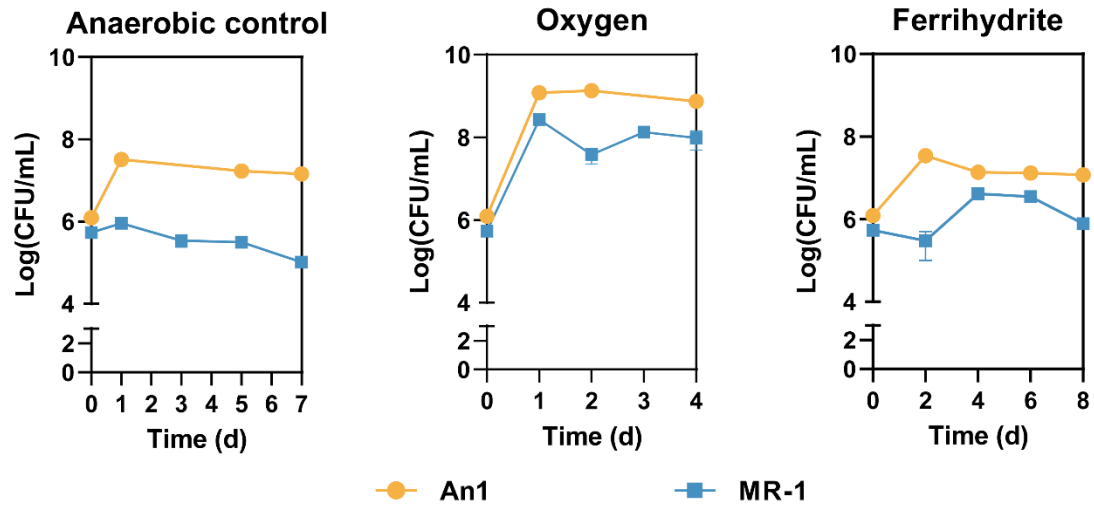


Fig. S1 The viable bacterial concentration curves of *S. oneidensis* MR-1 and *C. freundii* An1 in monoculture groups under different electron acceptor systems during a single incubation cycle.

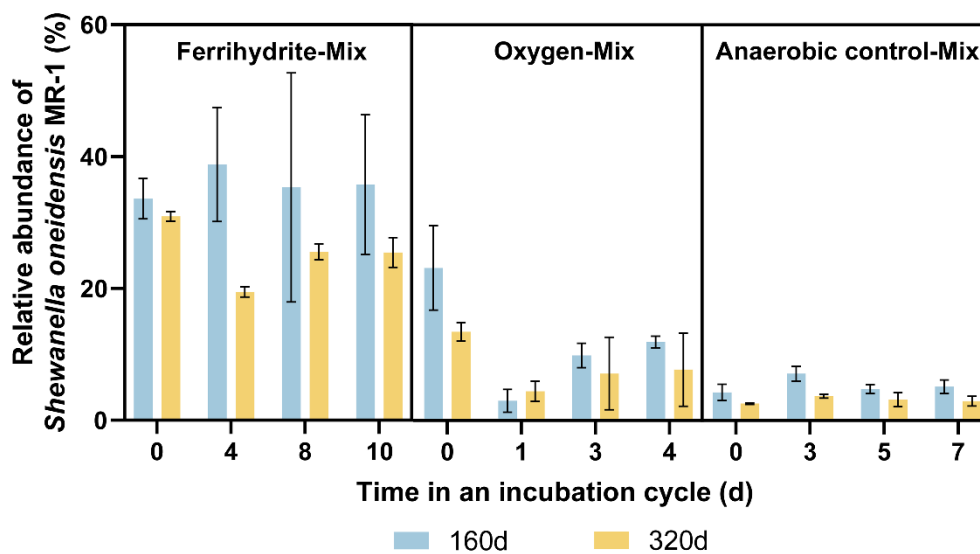


Fig. S2 The relative abundance of *S. oneidensis* MR-1 over the 160-day and 320-day incubation cycles.

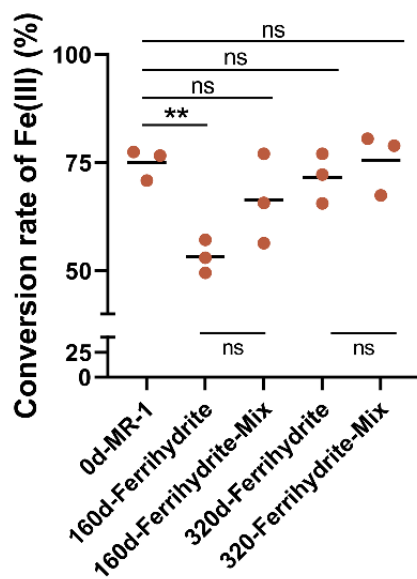


Fig. S3 The final Fe(III) conversion rate of ferrihydrite-adapted *S. oneidensis* MR-1 on day 10. T test, significance levels are as follows: *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$; ns, no significant difference.

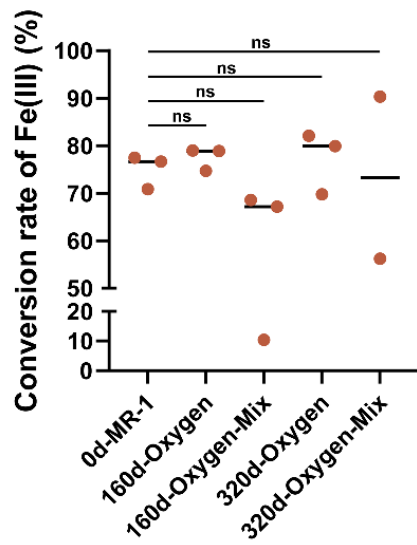


Fig. S4 The final Fe(III) conversion rate of oxygen-adapted *S. oneidensis* MR-1 on day 10. T test, significance levels are as follows: *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$; ns, no significant difference.

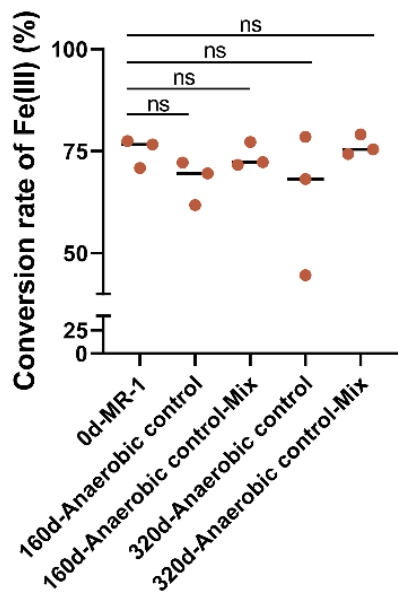


Fig. S5 The final Fe(III) conversion rate of anaerobic-adapted *S. oneidensis* MR-1 on day 10.

T test, significance levels are as follows: *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$; ns, no significant difference.

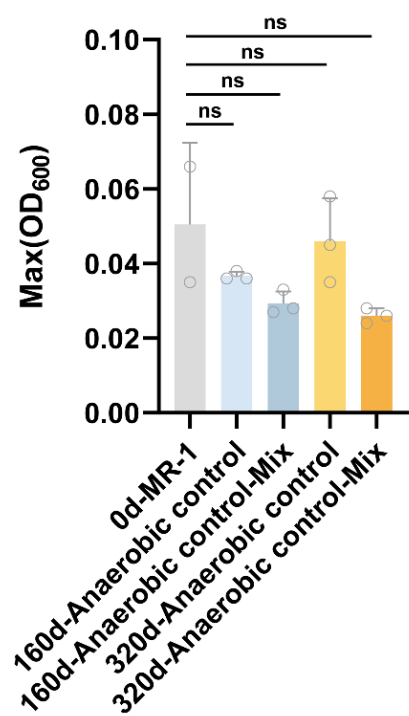


Fig. S6 The Max(OD₆₀₀) of anaerobic-adapted *S. oneidensis* MR-1 after 24 hours of **cultivation**. T test, significance levels are as follows: *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$; ns, no significant difference.

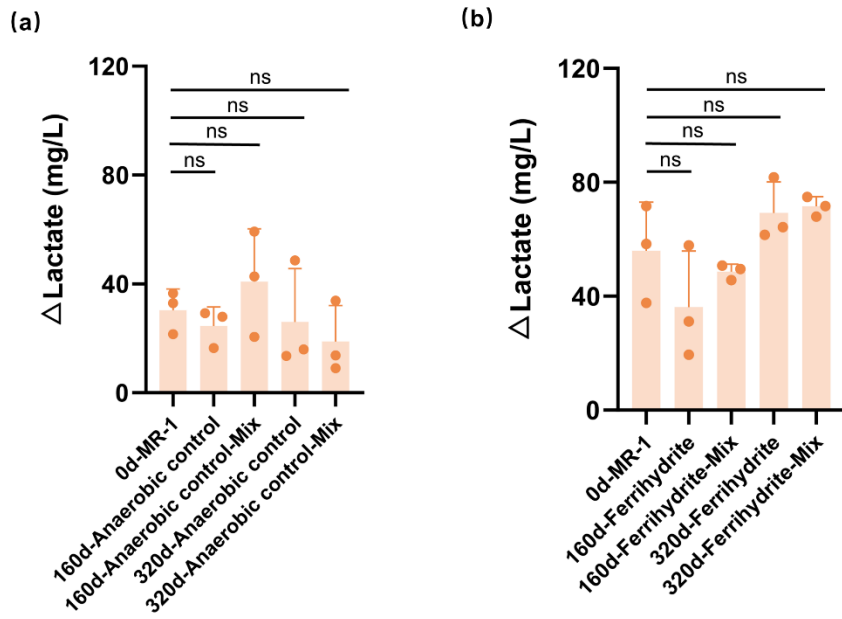


Fig. S7 The lactate consumption of *S. oneidensis* MR-1. (a) The lactate consumption of each group of anaerobic-adapted *S. oneidensis* MR-1 with no added electron acceptor. (b) The lactate consumption of each group of ferrihydrite-adapted *S. oneidensis* MR-1 with ferrihydrite. T test, significance levels are as follows: *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$; ns, no significant difference.

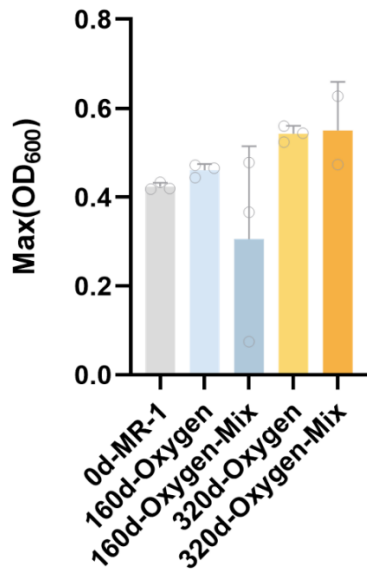


Fig. S8 Max(OD₆₀₀) of oxygen-adapted *S. oneidensis* MR-1 cultured for 28 hours with oxygen. Max(OD₆₀₀) represents the maximum optical density of growth curves

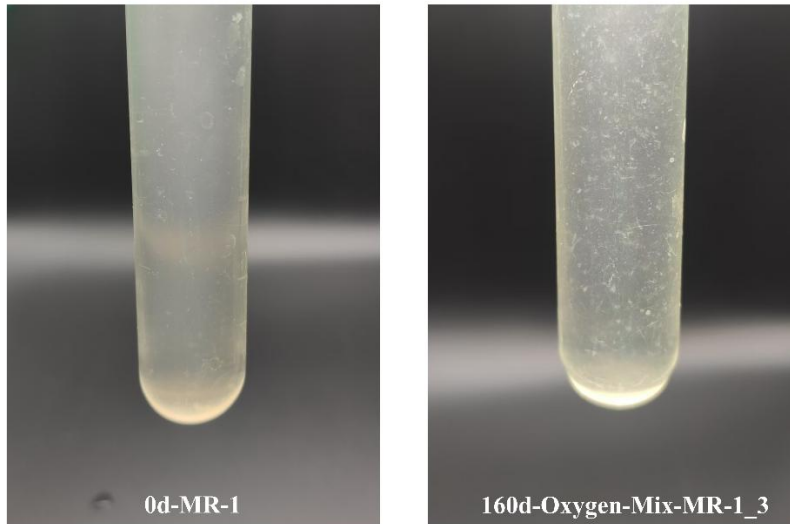


Fig. S9 Floccs in 160d-Oxygen-Mix-MR-1_3 with oxygen. The left image shows the bacterial culture of ancestral *S. oneidensis* MR-1 after 24 hours of cultivation with oxygen, while the right image shows the culture of 160d-Oxygen-Mix-MR-1_3, which exhibits numerous white floccs after the same cultivation period.

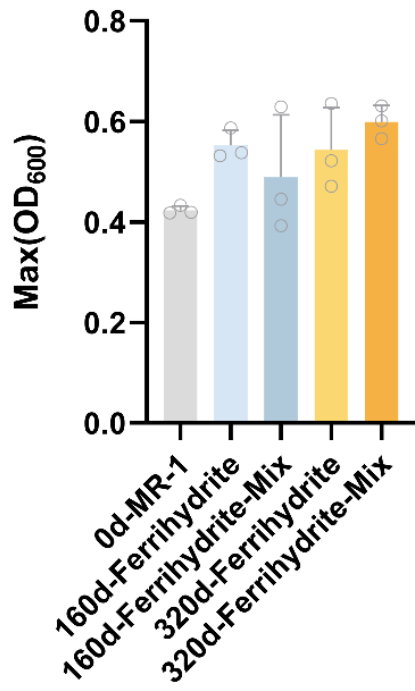


Fig. S10 The Max(OD₆₀₀) of ferrihydrite-adapted *S. oneidensis* MR-1 after 28 hours of cultivation under oxygen conditions.

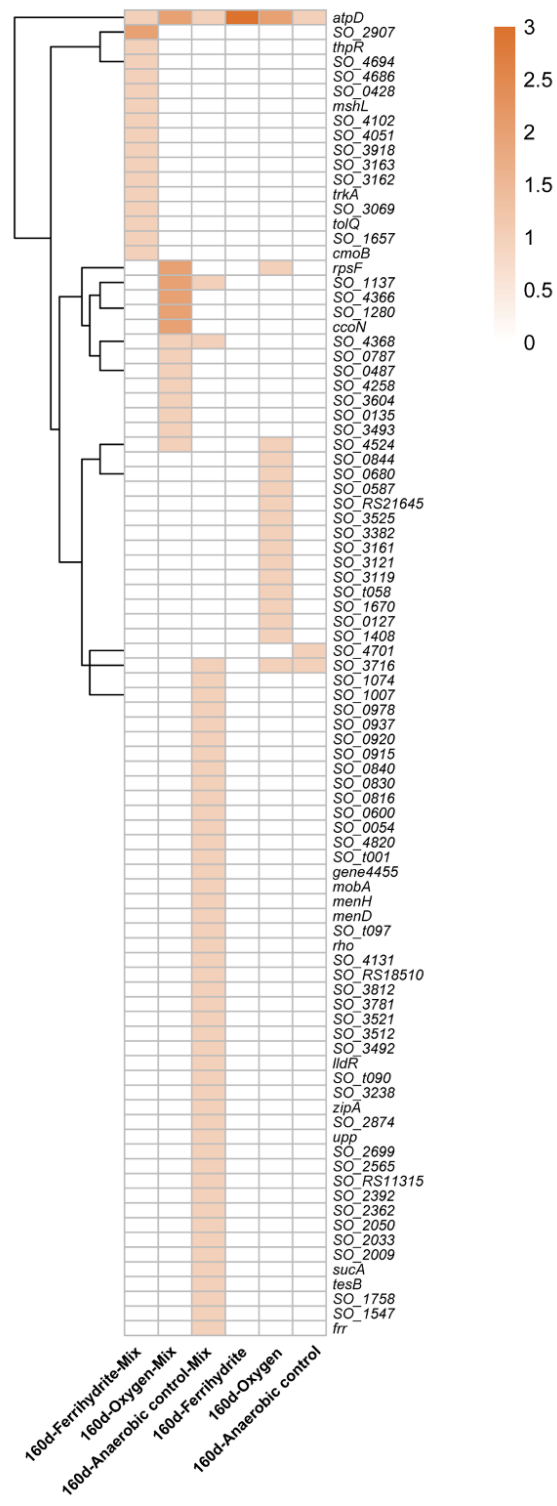


Fig. S11 The number of mutated genes and non-synonymous SNPs in the groups of *S. oneidensis* MR-1 cultured for 160 days.

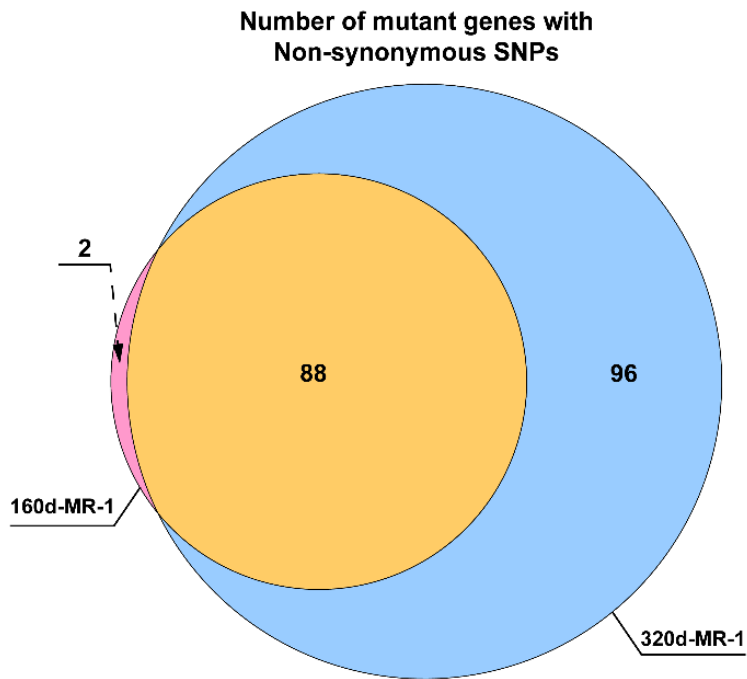


Fig. S13 The number of mutated genes with non-synonymous SNPs in the groups of *S. oneidensis* MR-1 that were cultured for 160 days and 320 days.

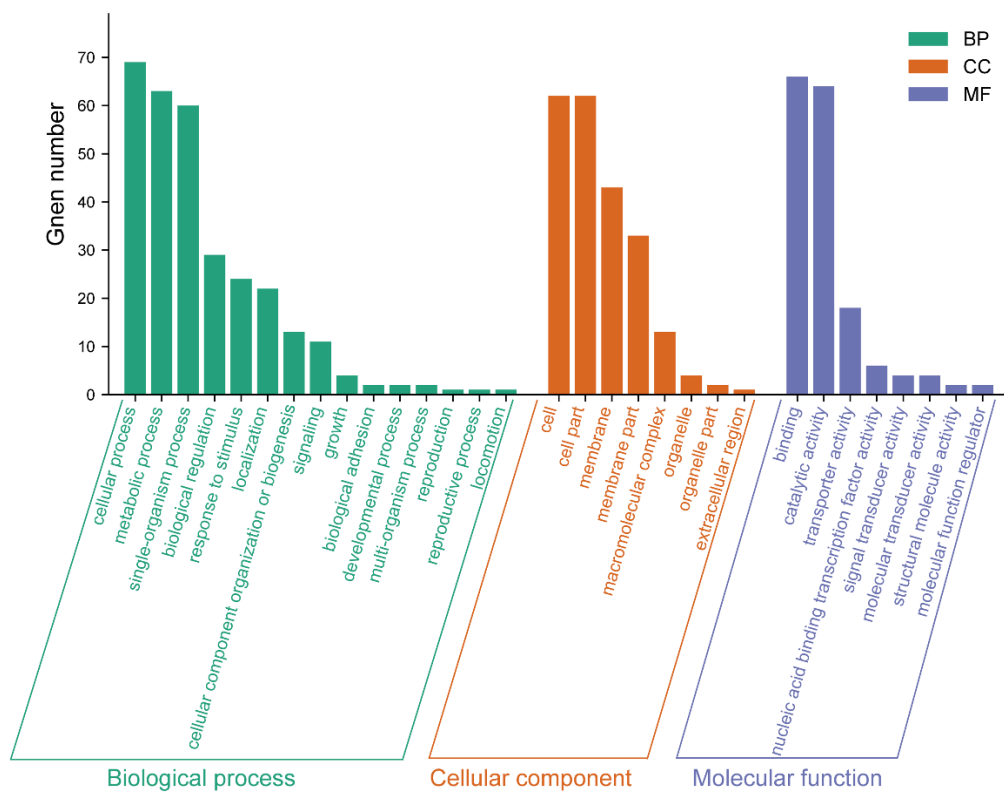


Fig. S14 GO database annotation of shared non-synonymous SNPs of all 320d *S. oneidensis* MR-1 samples. BP is marked by dark cyan; CC is marked by sienna and MF is marked by steel blue.

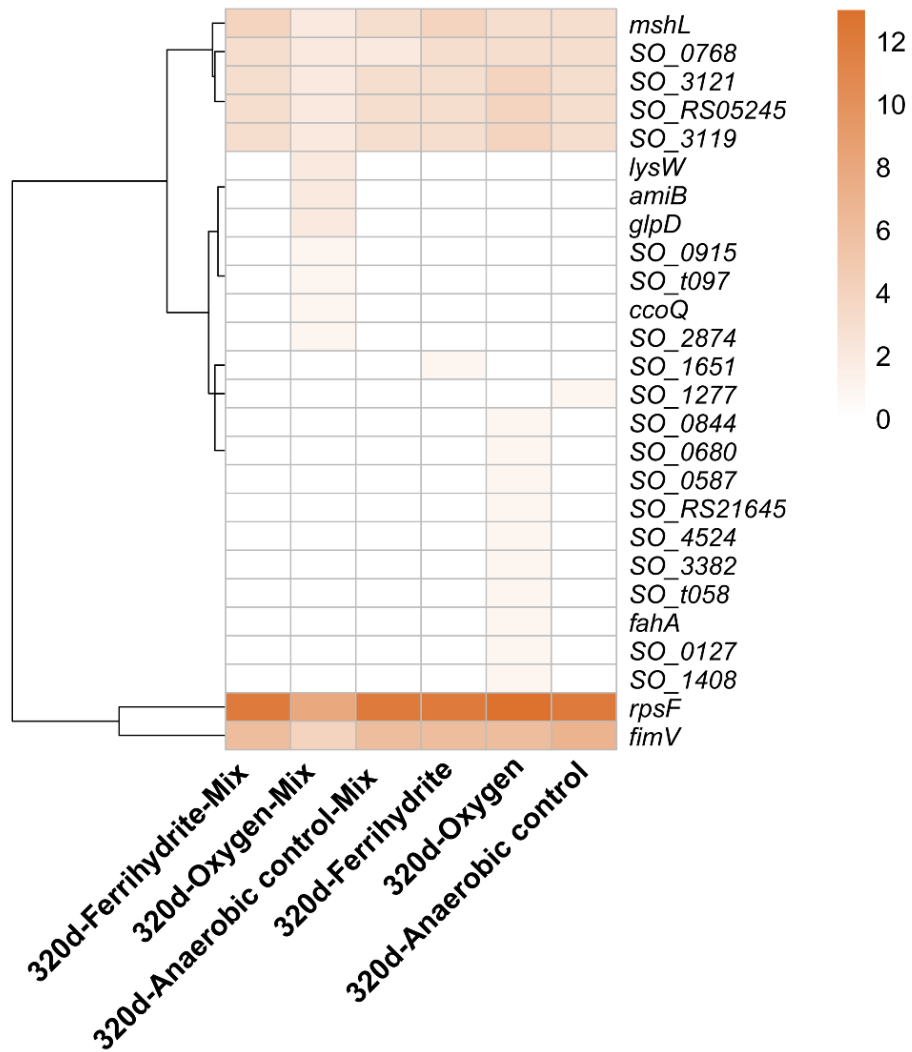


Fig. S15 The number of mutated genes and non-synonymous SNPs among the different groups of *S. oneidensis* MR-1 cultured for 320 days.

Supplementary Data 1 All identified SNPs and their annotations

| Sample name | Gene_ID | Reference base | Base substitution | Gene annotation |
|--------------------|-----------------|----------------|-------------------|--|
| 160d- | <i>trkA</i> | C | T | Trk system potassium transporter TrkA |
| Ferrihydrite- | <i>SO_1657</i> | G | T | YdcF family protein |
| Mix-MR-1_1 | <i>tolQ</i> | C | A | protein TolQ |
| | <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| | <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| | <i>SO_4051</i> | C | A | HlyD family secretion protein |
| 160d-Anaerobic | <i>SO_0816</i> | G | A | HDOD domain-containing protein |
| control-Mix-MR-1_3 | <i>SO_3716</i> | C | T | DNA-J related domain-containing protein |
| | <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate synthase |
| 160d-Anaerobic | <i>SO_t001</i> | C | T | tRNA-Asp |
| control-Mix-MR-1_2 | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |
| | <i>rho</i> | C | T | transcription termination factor Rho |
| | <i>SO_4820</i> | T | C | zinc ABC transporter |
| | <i>SO_0600</i> | G | T | N-acetylmuramoyl-L-alanine amidase |
| | <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain-containing protein |
| | <i>SO_0915</i> | C | T | ankyrin repeat domain-containing protein |
| | <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| | <i>SO_0937</i> | A | G | hypothetical protein |
| | <i>SO_0978</i> | C | T | glycerol-3-phosphate dehydrogenase/oxidase |
| | <i>SO_1007</i> | C | T | Na ⁺ /H ⁺ antiporter NhaC family protein |
| | <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| | <i>SO_1137</i> | A | G | M48 family metalloproteinase |
| | <i>SO_1547</i> | T | C | transposase |
| | <i>frr</i> | G | A | ribosome recycling factor |
| | <i>SO_1758</i> | A | G | YafY family protein |
| | <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| | <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| | <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| | <i>SO_2033</i> | A | G | AAA family ATPase |
| | <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| | <i>SO_2362</i> | T | C | CcoQ/FixQ family Cbb3-type cytochrome c oxidase assembly chaperone |
| | <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |
| | <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| | <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| | <i>SO_2699</i> | T | C | phage baseplate assembly protein |

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|-----------------------------------|-----------------|---|---|---|
| | <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| | <i>SO_2874</i> | T | C | IS630-like element ISSod10 family transposase |
| | <i>SO_3238</i> | G | A | flagellin |
| | <i>SO_t090</i> | T | C | tRNA-Ser |
| | <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| | <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| | <i>SO_3512</i> | C | T | SapC family protein |
| | <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| | <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| | <i>gene3723</i> | G | A | insulinase family protein |
| | <i>SO_4131</i> | G | A | outer membrane protein OmpK |
| | <i>SO_t097</i> | G | A | tRNA-Pro |
| | <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| | <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylic-acid synthase |
| | <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| | <i>gene4455</i> | C | T | peptidase domain-containing ABC transporter |
| 160d-Anaerobic control-Mix-MR-1_1 | <i>SO_0830</i> | G | A | alkaline phosphatase |
| | <i>zipA</i> | C | T | cell division protein ZipA |
| | <i>SO_3781</i> | G | A | type II secretion system protein |
| | <i>atpD</i> | T | C | F0F1 ATP synthase subunit beta |
| 160d-Oxygen-Mix-MR-1_2 | <i>SO_0135</i> | T | A | DUF333 domain-containing protein |
| | <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |
| | <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| | <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| 160d-Oxygen-Mix-MR-1_3 | <i>SO_1137</i> | T | A | M48 family metallopeptidase |
| | <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| | <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| | <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| | <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| | <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| | <i>SO_4524</i> | C | T | LysR family transcriptional regulator |
| | <i>atpD</i> | T | C | F0F1 ATP synthase subunit beta |
| 160d-Oxygen-Mix-MR-1_1 | <i>SO_1137</i> | T | A | M48 family metallopeptidase |
| | <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| | <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |

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|------------------------------|----------------|---|---|--|
| | <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| | <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| | <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain-containing protein |
| | <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| | <i>atpD</i> | T | C | F0F1 ATP synthase subunit beta |
| 160d-Ferrihydrite-Mix-MR-1_2 | <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| | <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |
| | <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| | <i>SO_4102</i> | A | G | PilW family protein |
| | <i>SO_4694</i> | A | T | TorF family putative porin |
| | <i>atpD</i> | T | C | F0F1 ATP synthase subunit beta |
| 160d-Ferrihydrite-Mix-MR-1_3 | <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| | <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| | <i>SO_3162</i> | T | C | sensor histidine kinase |
| | <i>SO_3918</i> | G | A | S46 family peptidase |
| | <i>mshL</i> | C | T | pilus (MSHA type) biogenesis protein MshL |
| | <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| 160d-Oxygen-MR-1_1 | <i>SO_3161</i> | T | A | hypothetical protein |
| | <i>atpD</i> | T | C | F0F1 ATP synthase subunit beta |
| 160d-Ferrihydrite-MR-1_1 | <i>atpD</i> | T | C | F0F1 ATP synthase subunit beta |
| 160d-Ferrihydrite-MR-1_2 | <i>atpD</i> | T | C | F0F1 ATP synthase subunit beta |
| 160d-Ferrihydrite-MR-1_3 | <i>atpD</i> | T | C | F0F1 ATP synthase subunit beta |
| 160d-Oxygen-MR-1_2 | <i>SO_3716</i> | C | T | DNA-J related domain-containing protein |
| 160d-Oxygen-MR-1_3 | <i>SO_0127</i> | C | T | metal transporter |
| | <i>SO_0587</i> | T | C | glycerophosphodiester phosphodiesterase |
| | <i>SO_0680</i> | C | T | tape measure protein |
| | <i>SO_0844</i> | A | G | hypothetical protein |
| | <i>SO_1408</i> | A | G | DEAD/DEAH box helicase family protein |
| | <i>SO_1670</i> | G | A | fumarylacetoacetate hydrolase family protein |
| | <i>SO_t058</i> | C | T | tRNA-Lys |
| | <i>SO_3119</i> | T | C | hypothetical protein |
| | <i>SO_3121</i> | T | C | CIA30 family protein |

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|-------------------------------|-----------------|---|---|---|
| | <i>SO_3382</i> | T | C | SDR family NAD(P)-dependent oxidoreductase |
| | <i>SO_3525</i> | T | C | pilus assembly protein |
| | <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| | <i>SO_4524</i> | C | T | LysR family transcriptional regulator |
| | <i>gene4350</i> | T | C | putative sulfate exporter family transporter |
| | <i>atpD</i> | T | C | F0F1 ATP synthase subunit beta |
| 160d-Anaerobic control-MR-1_2 | <i>SO_4701</i> | A | C | hypothetical protein |
| 160d-Anaerobic control-MR-1_3 | <i>SO_3716</i> | C | T | DNA-J related domain-containing protein |
| | <i>atpD</i> | T | C | F0F1 ATP synthase subunit beta |
| 320d-Ferrihydrite-Mix-MR-1_3 | <i>trkA</i> | C | T | Trk system potassium transporter TrkA |
| | <i>SO_t001</i> | C | T | tRNA-Asp |
| | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |
| | <i>yedF</i> | C | T | sulfurtransferase-like selenium metabolism protein YedF |
| | <i>SO_0135</i> | T | A | DUF333 domain-containing protein |
| | <i>rpsG</i> | A | G | 30S ribosomal protein S7 |
| | <i>SO_0298</i> | T | C | phosphoheptose isomerase |
| | <i>speF</i> | C | T | ornithine decarboxylase SpeF |
| | <i>speF</i> | G | T | ornithine decarboxylase SpeF |
| | <i>prpC</i> | C | T | 2-methylcitrate synthase |
| | <i>SO_0358</i> | G | C | RidA family protein |
| | <i>rho</i> | C | T | transcription termination factor Rho |
| | <i>yacG</i> | C | T | DNA gyrase inhibitor YacG |
| | <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| | <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |
| | <i>SO_0544</i> | A | G | CHASE domain-containing protein |
| | <i>SO_0544</i> | C | T | CHASE domain-containing protein |
| | <i>SO_4820</i> | T | C | zinc ABC transporter |
| | <i>SO_4820</i> | C | T | zinc ABC transporter |
| | <i>SO_0623</i> | C | T | PepSY domain-containing protein |
| | <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| | <i>SO_0768</i> | A | C | NAD(P)-dependent oxidoreductase |
| | <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| | <i>azu</i> | T | C | azurin |
| | <i>SO_0816</i> | G | A | HDOD domain-containing protein |
| | <i>SO_0830</i> | G | A | alkaline phosphatase |
| | <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain-containing protein |
| | <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| | <i>SO_0937</i> | A | G | hypothetical protein |

| | | | |
|-----------------|---|---|---|
| <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein |
| <i>SO_1006</i> | C | T | dienelactone hydrolase family protein |
| <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| <i>SO_1137</i> | C | T | M48 family metallopeptidase |
| <i>SO_1137</i> | G | A | M48 family metallopeptidase |
| <i>SO_1137</i> | A | G | M48 family metallopeptidase |
| <i>SO_1137</i> | T | A | M48 family metallopeptidase |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |
| <i>thyA</i> | A | G | thymidylate synthase |
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frr</i> | G | A | ribosome recycling factor |
| <i>SO_1657</i> | G | T | YdcF family protein |
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |
| <i>SO_t034</i> | G | A | tRNA-Cys |
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| <i>SO_1926</i> | G | A | citrate synthase |
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |

| | | | |
|-----------------|---|---|--|
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>tolQ</i> | C | A | protein TolQ |
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |

| | | | |
|----------------|---|---|--|
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |
| <i>gshA</i> | C | T | glutamate--cysteine ligase |
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |

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|-----------------|---|---|--|
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| <i>SO_3918</i> | G | A | S46 family peptidase |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 |
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 |
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>murA</i> | G | C | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC |
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding protein |
| <i>SO_3969</i> | A | G | OmpA family protein |
| <i>gene3723</i> | G | A | insulinase family protein |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein |
| <i>SO_4022</i> | C | T | pitrilysin family protein |
| <i>SO_4051</i> | C | A | HlyD family secretion protein |
| <i>SO_4051</i> | A | T | HlyD family secretion protein |
| <i>SO_4102</i> | A | G | PilW family protein |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL |
| <i>mshL</i> | C | T | pilus (MSHA type) biogenesis protein MshL |
| <i>SO_4131</i> | G | A | outer membrane protein OmpK |
| <i>hslV</i> | A | T | ATP-dependent protease subunit HslV |
| <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain- containing protein |
| <i>SO_4262</i> | G | A | hypothetical protein |
| <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB |
| <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB |
| <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit |
| <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| <i>SO_4421</i> | G | A | DUF2986 domain-containing protein |
| <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase |
| <i>SO_4525</i> | A | G | patatin family protein |

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|---------------|-----------------|---|---|---|
| | <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylic-acid synthase |
| | <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate synthase |
| | <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |
| | <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| | <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein YihA/YsxC |
| | <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| | <i>SO_4694</i> | A | T | TorF family putative porin |
| | <i>SO_4701</i> | T | C | hypothetical protein |
| | <i>SO_4701</i> | A | C | hypothetical protein |
| | <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| | <i>mmnG</i> | A | G | tRNA uridine-5-carboxymethylaminomethyl(34) synthesis enzyme MnmG |
| | <i>gene4455</i> | C | T | peptidase domain-containing ABC transporter |
| | <i>gene4523</i> | C | T | tandem-95 repeat protein |
| | <i>gene4526</i> | A | G | IS3 family transposase |
| 320d- | <i>trkA</i> | C | T | Trk system potassium transporter TrkA |
| Ferrihydrite- | <i>SO_t001</i> | C | T | tRNA-Asp |
| Mix-MR-1_2 | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |
| | <i>yedF</i> | C | T | sulfurtransferase-like selenium metabolism protein YedF |
| | <i>SO_0135</i> | T | A | DUF333 domain-containing protein |
| | <i>rpsG</i> | A | G | 30S ribosomal protein S7 |
| | <i>SO_0298</i> | T | C | phosphoheptose isomerase |
| | <i>speF</i> | C | T | ornithine decarboxylase SpeF |
| | <i>speF</i> | G | T | ornithine decarboxylase SpeF |
| | <i>prpC</i> | C | T | 2-methylcitrate synthase |
| | <i>SO_0358</i> | G | C | RidA family protein |
| | <i>rho</i> | C | T | transcription termination factor Rho |
| | <i>yacG</i> | C | T | DNA gyrase inhibitor YacG |
| | <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| | <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |
| | <i>SO_0544</i> | A | G | CHASE domain-containing protein |
| | <i>SO_0544</i> | C | T | CHASE domain-containing protein |
| | <i>SO_4820</i> | T | C | zinc ABC transporter |
| | <i>SO_4820</i> | C | T | zinc ABC transporter |
| | <i>SO_0623</i> | C | T | PepSY domain-containing protein |

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|-----------------|---|---|---|
| <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| <i>SO_0768</i> | A | C | NAD(P)-dependent oxidoreductase |
| <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| <i>azu</i> | T | C | azurin |
| <i>SO_0816</i> | G | A | HDOD domain-containing protein |
| <i>SO_0830</i> | G | A | alkaline phosphatase |
| <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain-containing protein |
| <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| <i>SO_0937</i> | A | G | hypothetical protein |
| <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein |
| <i>SO_1006</i> | C | T | dienelactone hydrolase family protein |
| <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| <i>SO_1137</i> | C | T | M48 family metallopeptidase |
| <i>SO_1137</i> | G | A | M48 family metallopeptidase |
| <i>SO_1137</i> | A | G | M48 family metallopeptidase |
| <i>SO_1137</i> | T | A | M48 family metallopeptidase |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |
| <i>thyA</i> | A | G | thymidylate synthase |
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frr</i> | G | A | ribosome recycling factor |
| <i>SO_1657</i> | G | T | YdcF family protein |
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |

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|-----------------|---|---|--|
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |
| <i>SO_t034</i> | G | A | tRNA-Cys |
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| <i>SO_1926</i> | G | A | citrate synthase |
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>tolQ</i> | C | A | protein TolQ |

| | | | |
|----------------|---|---|--|
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L-altrosamine transaminase |
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L-altrosamine transaminase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |

| | | | |
|-----------------|---|---|--|
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |
| <i>gshA</i> | C | T | glutamate--cysteine ligase |
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| <i>SO_3918</i> | G | A | S46 family peptidase |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 |
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 |
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>murA</i> | G | C | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC |
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding protein |
| <i>SO_3969</i> | A | G | OmpA family protein |
| <i>gene3723</i> | G | A | insulinase family protein |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein |
| <i>SO_4022</i> | C | T | pitrilysin family protein |
| <i>SO_4051</i> | C | A | HlyD family secretion protein |
| <i>SO_4051</i> | A | T | HlyD family secretion protein |
| <i>SO_4102</i> | A | G | PilW family protein |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL |
| <i>SO_4131</i> | G | A | outer membrane protein OmpK |
| <i>hslV</i> | A | T | ATP-dependent protease subunit HslV |
| <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain-containing protein |
| <i>SO_4262</i> | G | A | hypothetical protein |

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|---------------|-----------------|---|---|---|
| | <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB |
| | <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB |
| | <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit |
| | <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| | <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| | <i>SO_4421</i> | G | A | DUF2986 domain-containing protein |
| | <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase |
| | <i>SO_4525</i> | A | G | patatin family protein |
| | <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylic-acid synthase |
| | <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate synthase |
| | <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |
| | <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| | <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein YihA/YsxC |
| | <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| | <i>SO_4694</i> | A | T | TorF family putative porin |
| | <i>SO_4701</i> | T | C | hypothetical protein |
| | <i>SO_4701</i> | A | C | hypothetical protein |
| | <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| | <i>mmnG</i> | A | G | tRNA uridine-5-carboxymethylaminomethyl(34) synthesis enzyme MnmG |
| | <i>gene4455</i> | C | T | peptidase domain-containing ABC transporter |
| | <i>gene4523</i> | C | T | tandem-95 repeat protein |
| | <i>gene4526</i> | A | G | IS3 family transposase |
| 320d- | <i>trkA</i> | C | T | Trk system potassium transporter TrkA |
| Ferrihydrite- | <i>SO_t001</i> | C | T | tRNA-Asp |
| Mix-MR-1_1 | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |
| | <i>yedF</i> | C | T | sulfurtransferase-like selenium metabolism protein YedF |
| | <i>SO_0135</i> | T | A | DUF333 domain-containing protein |
| | <i>rpsG</i> | A | G | 30S ribosomal protein S7 |
| | <i>SO_0298</i> | T | C | phosphoheptose isomerase |
| | <i>speF</i> | C | T | ornithine decarboxylase SpeF |
| | <i>speF</i> | G | T | ornithine decarboxylase SpeF |

| | | | |
|-----------------|---|---|---|
| <i>prpC</i> | C | T | 2-methylcitrate synthase |
| <i>SO_0358</i> | G | C | RidA family protein |
| <i>rho</i> | C | T | transcription termination factor Rho |
| <i>yacG</i> | C | T | DNA gyrase inhibitor YacG |
| <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |
| <i>SO_0544</i> | A | G | CHASE domain-containing protein |
| <i>SO_0544</i> | C | T | CHASE domain-containing protein |
| <i>SO_4820</i> | T | C | zinc ABC transporter |
| <i>SO_4820</i> | C | T | zinc ABC transporter |
| <i>SO_0623</i> | C | T | PepSY domain-containing protein |
| <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| <i>SO_0768</i> | A | C | NAD(P)-dependent oxidoreductase |
| <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| <i>azu</i> | T | C | azurin |
| <i>SO_0816</i> | G | A | HDOD domain-containing protein |
| <i>SO_0830</i> | G | A | alkaline phosphatase |
| <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain-containing protein |
| <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| <i>SO_0937</i> | A | G | hypothetical protein |
| <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein |
| <i>SO_1006</i> | C | T | dienelactone hydrolase family protein |
| <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| <i>SO_1137</i> | C | T | M48 family metallopeptidase |
| <i>SO_1137</i> | G | A | M48 family metallopeptidase |
| <i>SO_1137</i> | A | G | M48 family metallopeptidase |
| <i>SO_1137</i> | T | A | M48 family metallopeptidase |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |
| <i>thyA</i> | A | G | thymidylate synthase |
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |

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|----------------|---|---|--|
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frr</i> | G | A | ribosome recycling factor |
| <i>SO_1657</i> | G | T | YdcF family protein |
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |
| <i>SO_t034</i> | G | A | tRNA-Cys |
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| <i>SO_1926</i> | G | A | citrate synthase |
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |

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|-----------------|---|---|--|
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>tolQ</i> | C | A | protein TolQ |
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L-altrosamine transaminase |

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|-----------------|---|---|--|
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L-altrosamine transaminase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |
| <i>gshA</i> | C | T | glutamate--cysteine ligase |
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| <i>SO_3918</i> | G | A | S46 family peptidase |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 |
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 |
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>murA</i> | G | C | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC |
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding protein |
| <i>SO_3969</i> | A | G | OmpA family protein |
| <i>gene3723</i> | G | A | insulinase family protein |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein |

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|-----------------|---|---|---|
| <i>SO_4022</i> | C | T | pitrilysin family protein |
| <i>SO_4051</i> | C | A | HlyD family secretion protein |
| <i>SO_4051</i> | A | T | HlyD family secretion protein |
| <i>SO_4102</i> | A | G | PilW family protein |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL |
| <i>SO_4131</i> | G | A | outer membrane protein OmpK |
| <i>hslV</i> | A | T | ATP-dependent protease subunit HslV |
| <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain-containing protein |
| <i>SO_4262</i> | G | A | hypothetical protein |
| <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB |
| <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB |
| <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit |
| <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| <i>SO_4421</i> | G | A | DUF2986 domain-containing protein |
| <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase |
| <i>SO_4525</i> | A | G | patatin family protein |
| <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylic-acid synthase |
| <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate synthase |
| <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |
| <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein YihA/YsxC |
| <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| <i>SO_4694</i> | A | T | TorF family putative porin |
| <i>SO_4701</i> | T | C | hypothetical protein |
| <i>SO_4701</i> | A | C | hypothetical protein |
| <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| <i>mmnG</i> | A | G | tRNA uridine-5-carboxymethylaminomethyl(34) synthesis enzyme MnmG |
| <i>gene4455</i> | C | T | peptidase domain-containing ABC transporter |
| <i>gene4526</i> | A | G | IS3 family transposase |
| <i>trkA</i> | C | T | Trk system potassium transporter TrkA |

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|--------------|-----------------|---|---|--|
| 320d-Oxygen- | <i>SO_t001</i> | C | T | tRNA-Asp |
| Mix-MR-1_3 | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |
| | <i>yedF</i> | C | T | sulfurtransferase-like selenium metabolism protein YedF |
| | <i>SO_0135</i> | T | A | DUF333 domain-containing protein |
| | <i>rpsG</i> | A | G | 30S ribosomal protein S7 |
| | <i>SO_0298</i> | T | C | phosphoheptose isomerase |
| | <i>speF</i> | C | T | ornithine decarboxylase SpeF |
| | <i>speF</i> | G | T | ornithine decarboxylase SpeF |
| | <i>prpC</i> | C | T | 2-methylcitrate synthase |
| | <i>SO_0358</i> | G | C | RidA family protein |
| | <i>rho</i> | C | T | transcription termination factor Rho |
| | <i>yacG</i> | C | T | DNA gyrase inhibitor YacG |
| | <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| | <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |
| | <i>SO_0544</i> | A | G | CHASE domain-containing protein |
| | <i>SO_0544</i> | C | T | CHASE domain-containing protein |
| | <i>SO_4820</i> | T | C | zinc ABC transporter |
| | <i>SO_4820</i> | C | T | zinc ABC transporter |
| | <i>SO_0600</i> | G | T | N-acetylmuramoyl-L-alanine amidase |
| | <i>SO_0623</i> | C | T | PepSY domain-containing protein |
| | <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| | <i>SO_0768</i> | A | C | NAD(P)-dependent oxidoreductase |
| | <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| | <i>azu</i> | T | C | azurin |
| | <i>SO_0816</i> | G | A | HDOD domain-containing protein |
| | <i>SO_0830</i> | G | A | alkaline phosphatase |
| | <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain-containing protein |
| | <i>SO_0915</i> | C | T | ankyrin repeat domain-containing protein |
| | <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| | <i>SO_0937</i> | A | G | hypothetical protein |
| | <i>SO_0978</i> | C | T | glycerol-3-phosphate dehydrogenase/oxidase |
| | <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein |
| | <i>SO_1006</i> | C | T | dienelactone hydrolase family protein |
| | <i>SO_1007</i> | C | T | Na ⁺ /H ⁺ antiporter NhaC family protein |
| | <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| | <i>SO_1137</i> | C | T | M48 family metalloproteinase |
| | <i>SO_1137</i> | G | A | M48 family metalloproteinase |
| | <i>SO_1137</i> | A | G | M48 family metalloproteinase |
| | <i>SO_1137</i> | T | A | M48 family metalloproteinase |
| | <i>gene1050</i> | A | G | hypothetical protein |

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|----------------|---|---|---|
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |
| <i>thyA</i> | A | G | thymidylate synthase |
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frr</i> | G | A | ribosome recycling factor |
| <i>SO_1657</i> | G | T | YdcF family protein |
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |
| <i>SO_t034</i> | G | A | tRNA-Cys |
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| <i>SO_1926</i> | G | A | citrate synthase |
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |

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|-----------------|---|---|--|
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |
| <i>SO_2362</i> | T | C | CcoQ/FixQ family Cbb3-type cytochrome c oxidase assembly chaperone |
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>tolQ</i> | C | A | protein TolQ |
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |
| <i>SO_2874</i> | T | C | IS630-like element ISSod10 family transposase |
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |

| | | | |
|----------------|---|---|--|
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |
| <i>gshA</i> | C | T | glutamate--cysteine ligase |
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| <i>SO_3918</i> | G | A | S46 family peptidase |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 |

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|-----------------|---|---|---|
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 |
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>murA</i> | G | C | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC |
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding protein |
| <i>SO_3969</i> | A | G | OmpA family protein |
| <i>gene3723</i> | G | A | insulinase family protein |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein |
| <i>SO_4022</i> | C | T | pitrilysin family protein |
| <i>SO_4051</i> | C | A | HlyD family secretion protein |
| <i>SO_4051</i> | A | T | HlyD family secretion protein |
| <i>SO_4102</i> | A | G | PilW family protein |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL |
| <i>SO_4131</i> | G | A | outer membrane protein OmpK |
| <i>hslV</i> | A | T | ATP-dependent protease subunit HslV |
| <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain- containing protein |
| <i>SO_4262</i> | G | A | hypothetical protein |
| <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB |
| <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB |
| <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit |
| <i>SO_t097</i> | G | A | tRNA-Pro |
| <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| <i>SO_4421</i> | G | A | DUF2986 domain-containing protein |
| <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase |
| <i>SO_4525</i> | A | G | patatin family protein |
| <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3- cyclohexene-1-carboxylic-acid synthase |
| <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1- carboxylate synthase |
| <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |

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|------------------------|-----------------|---|---|---|
| | <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| | <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein YihA/YsxC |
| | <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| | <i>SO_4694</i> | A | T | TorF family putative porin |
| | <i>SO_4701</i> | T | C | hypothetical protein |
| | <i>SO_4701</i> | A | C | hypothetical protein |
| | <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| | <i>mnmG</i> | A | G | tRNA uridine-5-carboxymethylaminomethyl(34) synthesis enzyme MnmG |
| | <i>gene4455</i> | C | T | peptidase domain-containing ABC transporter |
| | <i>gene4526</i> | A | G | IS3 family transposase |
| 320d-Oxygen-Mix-MR-1_2 | <i>trkA</i> | C | T | Trk system potassium transporter TrkA |
| | <i>SO_t001</i> | C | T | tRNA-Asp |
| | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |
| | <i>yedF</i> | C | T | sulfurtransferase-like selenium metabolism protein YedF |
| | <i>SO_0135</i> | T | A | DUF333 domain-containing protein |
| | <i>rpsG</i> | A | G | 30S ribosomal protein S7 |
| | <i>SO_0298</i> | T | C | phosphoheptose isomerase |
| | <i>speF</i> | C | T | ornithine decarboxylase SpeF |
| | <i>speF</i> | G | T | ornithine decarboxylase SpeF |
| | <i>prpC</i> | C | T | 2-methylcitrate synthase |
| | <i>SO_0358</i> | G | C | RidA family protein |
| | <i>rho</i> | C | T | transcription termination factor Rho |
| | <i>yacG</i> | C | T | DNA gyrase inhibitor YacG |
| | <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| | <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |
| | <i>SO_0544</i> | A | G | CHASE domain-containing protein |
| | <i>SO_0544</i> | C | T | CHASE domain-containing protein |
| | <i>SO_4820</i> | T | C | zinc ABC transporter |
| | <i>SO_4820</i> | C | T | zinc ABC transporter |
| | <i>SO_0600</i> | G | T | N-acetylmuramoyl-L-alanine amidase |
| | <i>SO_0623</i> | C | T | PepSY domain-containing protein |
| | <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| | <i>SO_0768</i> | A | C | NAD(P)-dependent oxidoreductase |
| | <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| | <i>azu</i> | T | C | azurin |
| | <i>SO_0816</i> | G | A | HDOD domain-containing protein |

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|-----------------|---|---|--|
| <i>SO_0830</i> | G | A | alkaline phosphatase |
| <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain-containing protein |
| <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| <i>SO_0937</i> | A | G | hypothetical protein |
| <i>SO_0978</i> | C | T | glycerol-3-phosphate dehydrogenase/oxidase |
| <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein |
| <i>SO_1006</i> | C | T | dienelactone hydrolase family protein |
| <i>SO_1007</i> | C | T | Na ⁺ /H ⁺ antiporter NhaC family protein |
| <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| <i>SO_1137</i> | C | T | M48 family metallopeptidase |
| <i>SO_1137</i> | G | A | M48 family metallopeptidase |
| <i>SO_1137</i> | A | G | M48 family metallopeptidase |
| <i>SO_1137</i> | T | A | M48 family metallopeptidase |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |
| <i>thyA</i> | A | G | thymidylate synthase |
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frr</i> | G | A | ribosome recycling factor |
| <i>SO_1657</i> | G | T | YdcF family protein |
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |
| <i>SO_t034</i> | G | A | tRNA-Cys |

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|-----------------|---|---|--|
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| <i>SO_1926</i> | G | A | citrate synthase |
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>tolQ</i> | C | A | protein TolQ |
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |

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|----------------|---|---|--|
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |
| <i>gshA</i> | C | T | glutamate--cysteine ligase |

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|-----------------|---|---|--|
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| <i>SO_3918</i> | G | A | S46 family peptidase |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 |
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 |
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>murA</i> | G | C | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC |
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding protein |
| <i>SO_3969</i> | A | G | OmpA family protein |
| <i>gene3723</i> | G | A | insulinase family protein |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein |
| <i>SO_4022</i> | C | T | pitrilysin family protein |
| <i>SO_4051</i> | C | A | HlyD family secretion protein |
| <i>SO_4051</i> | A | T | HlyD family secretion protein |
| <i>SO_4102</i> | A | G | PilW family protein |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL |
| <i>SO_4131</i> | G | A | outer membrane protein OmpK |
| <i>hslV</i> | A | T | ATP-dependent protease subunit HslV |
| <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain-containing protein |
| <i>SO_4262</i> | G | A | hypothetical protein |
| <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB |
| <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB |

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|-----------------------------------|-----------------|---|---|---|
| | <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit |
| | <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| | <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| | <i>SO_4421</i> | G | A | DUF2986 domain-containing protein |
| | <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase |
| | <i>SO_4525</i> | A | G | patatin family protein |
| | <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylic-acid synthase |
| | <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate synthase |
| | <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |
| | <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| | <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein YihA/YsxC |
| | <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| | <i>SO_4694</i> | A | T | TorF family putative porin |
| | <i>SO_4701</i> | T | C | hypothetical protein |
| | <i>SO_4701</i> | A | C | hypothetical protein |
| | <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| | <i>mnmG</i> | A | G | tRNA uridine-5-carboxymethylaminomethyl(34) synthesis enzyme MnmG |
| | <i>gene4455</i> | C | T | peptidase domain-containing ABC transporter |
| | <i>gene4523</i> | C | T | tandem-95 repeat protein |
| | <i>gene4526</i> | A | G | IS3 family transposase |
| 320d-Anaerobic control-Mix-MR-1_3 | <i>trkA</i> | C | T | Trk system potassium transporter TrkA |
| | <i>SO_t001</i> | C | T | tRNA-Asp |
| | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |
| | <i>yedF</i> | C | T | sulfurtransferase-like selenium metabolism protein YedF |
| | <i>SO_0135</i> | T | A | DUF333 domain-containing protein |
| | <i>rpsG</i> | A | G | 30S ribosomal protein S7 |
| | <i>SO_0298</i> | T | C | phosphoheptose isomerase |
| | <i>speF</i> | C | T | ornithine decarboxylase SpeF |
| | <i>speF</i> | G | T | ornithine decarboxylase SpeF |
| | <i>prpC</i> | C | T | 2-methylcitrate synthase |
| | <i>SO_0358</i> | G | C | RidA family protein |
| | <i>rho</i> | C | T | transcription termination factor Rho |
| | <i>yacG</i> | C | T | DNA gyrase inhibitor YacG |

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|-----------------|---|---|---|
| <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |
| <i>SO_0544</i> | A | G | CHASE domain-containing protein |
| <i>SO_0544</i> | C | T | CHASE domain-containing protein |
| <i>SO_4820</i> | T | C | zinc ABC transporter |
| <i>SO_4820</i> | C | T | zinc ABC transporter |
| <i>SO_0623</i> | C | T | PepSY domain-containing protein |
| <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| <i>SO_0768</i> | A | C | NAD(P)-dependent oxidoreductase |
| <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| <i>azu</i> | T | C | azurin |
| <i>SO_0816</i> | G | A | HDOD domain-containing protein |
| <i>SO_0830</i> | G | A | alkaline phosphatase |
| <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain-containing protein |
| <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| <i>SO_0937</i> | A | G | hypothetical protein |
| <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein |
| <i>SO_1006</i> | C | T | dienelactone hydrolase family protein |
| <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| <i>SO_1137</i> | C | T | M48 family metalloproteinase |
| <i>SO_1137</i> | G | A | M48 family metalloproteinase |
| <i>SO_1137</i> | A | G | M48 family metalloproteinase |
| <i>SO_1137</i> | T | A | M48 family metalloproteinase |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |
| <i>thyA</i> | A | G | thymidylate synthase |
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frr</i> | G | A | ribosome recycling factor |
| <i>SO_1657</i> | G | T | YdcF family protein |

| | | | |
|-----------------|---|---|--|
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |
| <i>SO_t034</i> | G | A | tRNA-Cys |
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| <i>SO_1926</i> | G | A | citrate synthase |
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |

| | | | |
|----------------|---|---|--|
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>tolQ</i> | C | A | protein TolQ |
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L-altrosamine transaminase |
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L-altrosamine transaminase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |

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|-----------------|---|---|--|
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |
| <i>gshA</i> | C | T | glutamate--cysteine ligase |
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| <i>SO_3918</i> | G | A | S46 family peptidase |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 |
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 |
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>murA</i> | G | C | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC |
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding protein |
| <i>SO_3969</i> | A | G | OmpA family protein |
| <i>gene3723</i> | G | A | insulinase family protein |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein |
| <i>SO_4022</i> | C | T | pitrilysin family protein |
| <i>SO_4051</i> | C | A | HlyD family secretion protein |
| <i>SO_4051</i> | A | T | HlyD family secretion protein |
| <i>SO_4102</i> | A | G | PilW family protein |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL |

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|-----------------|-----------------|---|---|---|
| | <i>SO_4131</i> | G | A | outer membrane protein OmpK |
| | <i>hslV</i> | A | T | ATP-dependent protease subunit HslV |
| | <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain-containing protein |
| | <i>SO_4262</i> | G | A | hypothetical protein |
| | <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB |
| | <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB |
| | <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit |
| | <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| | <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| | <i>SO_4421</i> | G | A | DUF2986 domain-containing protein |
| | <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase |
| | <i>SO_4525</i> | A | G | patatin family protein |
| | <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylic-acid synthase |
| | <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate synthase |
| | <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |
| | <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| | <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein YihA/YsxC |
| | <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| | <i>SO_4694</i> | A | T | TorF family putative porin |
| | <i>SO_4701</i> | T | C | hypothetical protein |
| | <i>SO_4701</i> | A | C | hypothetical protein |
| | <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| | <i>mnmG</i> | A | G | tRNA uridine-5-carboxymethylaminomethyl(34) synthesis enzyme MnmG |
| | <i>gene4455</i> | C | T | peptidase domain-containing ABC transporter |
| | <i>gene4523</i> | C | T | tandem-95 repeat protein |
| | <i>gene4526</i> | A | G | IS3 family transposase |
| 320d-Anaerobic | <i>trkA</i> | C | T | Trk system potassium transporter TrkA |
| control-Mix-MR- | <i>SO_t001</i> | C | T | tRNA-Asp |
| 1_2 | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |
| | <i>yedF</i> | C | T | sulfurtransferase-like selenium metabolism protein YedF |

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|-----------------|---|---|---|
| <i>SO_0135</i> | T | A | DUF333 domain-containing protein |
| <i>rpsG</i> | A | G | 30S ribosomal protein S7 |
| <i>SO_0298</i> | T | C | phosphoheptose isomerase |
| <i>speF</i> | C | T | ornithine decarboxylase SpeF |
| <i>speF</i> | G | T | ornithine decarboxylase SpeF |
| <i>prpC</i> | C | T | 2-methylcitrate synthase |
| <i>SO_0358</i> | G | C | RidA family protein |
| <i>rho</i> | C | T | transcription termination factor Rho |
| <i>yacG</i> | C | T | DNA gyrase inhibitor YacG |
| <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |
| <i>SO_0544</i> | A | G | CHASE domain-containing protein |
| <i>SO_0544</i> | C | T | CHASE domain-containing protein |
| <i>SO_4820</i> | T | C | zinc ABC transporter |
| <i>SO_4820</i> | C | T | zinc ABC transporter |
| <i>SO_0623</i> | C | T | PepSY domain-containing protein |
| <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| <i>azu</i> | T | C | azurin |
| <i>SO_0816</i> | G | A | HDOD domain-containing protein |
| <i>SO_0830</i> | G | A | alkaline phosphatase |
| <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain-containing protein |
| <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| <i>SO_0937</i> | A | G | hypothetical protein |
| <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein |
| <i>SO_1006</i> | C | T | dienelactone hydrolase family protein |
| <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| <i>SO_1137</i> | C | T | M48 family metallopeptidase |
| <i>SO_1137</i> | G | A | M48 family metallopeptidase |
| <i>SO_1137</i> | A | G | M48 family metallopeptidase |
| <i>SO_1137</i> | T | A | M48 family metallopeptidase |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |

| | | | |
|----------------|---|---|---|
| <i>thyA</i> | A | G | thymidylate synthase |
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frr</i> | G | A | ribosome recycling factor |
| <i>SO_1657</i> | G | T | YdcF family protein |
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |
| <i>SO_t034</i> | G | A | tRNA-Cys |
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| <i>SO_1926</i> | G | A | citrate synthase |
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |

| | | | |
|-----------------|---|---|--|
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>tolQ</i> | C | A | protein TolQ |
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |

| | | | |
|----------------|---|---|--|
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |
| <i>gshA</i> | C | T | glutamate--cysteine ligase |
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| <i>SO_3918</i> | G | A | S46 family peptidase |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 |
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 |
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine 1- carboxyvinyltransferase |
| <i>murA</i> | G | C | UDP-N-acetylglucosamine 1- carboxyvinyltransferase |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC |

| | | | |
|-----------------|---|---|---|
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding protein |
| <i>SO_3969</i> | A | G | OmpA family protein |
| <i>gene3723</i> | G | A | insulinase family protein |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein |
| <i>SO_4022</i> | C | T | pitriysin family protein |
| <i>SO_4051</i> | C | A | HlyD family secretion protein |
| <i>SO_4051</i> | A | T | HlyD family secretion protein |
| <i>SO_4102</i> | A | G | PilW family protein |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL |
| <i>SO_4131</i> | G | A | outer membrane protein OmpK |
| <i>hslV</i> | A | T | ATP-dependent protease subunit HslV |
| <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain-containing protein |
| <i>SO_4262</i> | G | A | hypothetical protein |
| <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB |
| <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB |
| <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit |
| <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| <i>SO_4421</i> | G | A | DUF2986 domain-containing protein |
| <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase |
| <i>SO_4525</i> | A | G | patatin family protein |
| <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylic-acid synthase |
| <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate synthase |
| <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |
| <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein YihA/YsxC |
| <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| <i>SO_4694</i> | A | T | TorF family putative porin |
| <i>SO_4701</i> | T | C | hypothetical protein |
| <i>SO_4701</i> | A | C | hypothetical protein |
| <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |

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|------------------------|-----------------|---|---|---|--------------------------|
| | <i>mnmG</i> | A | G | tRNA carboxymethylaminomethyl(34) enzyme MnmG | uridine-5- synthesis |
| | <i>gene4455</i> | C | T | peptidase transporter | domain-containing ABC |
| | <i>gene4526</i> | A | G | IS3 family transposase | |
| 320d-Anaerobic | <i>trkA</i> | C | T | Trk system potassium transporter | TrkA |
| control-Mix-MR-SO_t001 | <i>SO_t001</i> | C | T | tRNA-Asp | |
| 1_1 | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase | |
| | <i>yedF</i> | C | T | sulfurtransferase-like protein YedF | selenium metabolism |
| | <i>SO_0135</i> | T | A | DUF333 domain-containing protein | |
| | <i>rpsG</i> | A | G | 30S ribosomal protein S7 | |
| | <i>SO_0298</i> | T | C | phosphoheptose isomerase | |
| | <i>speF</i> | C | T | ornithine decarboxylase SpeF | |
| | <i>speF</i> | G | T | ornithine decarboxylase SpeF | |
| | <i>prpC</i> | C | T | 2-methylcitrate synthase | |
| | <i>SO_0358</i> | G | C | RidA family protein | |
| | <i>rho</i> | C | T | transcription termination factor Rho | |
| | <i>yacG</i> | C | T | DNA gyrase inhibitor YacG | |
| | <i>SO_0428</i> | G | A | patatin-like phospholipase family protein | |
| | <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein | |
| | <i>SO_0544</i> | A | G | CHASE domain-containing protein | |
| | <i>SO_0544</i> | C | T | CHASE domain-containing protein | |
| | <i>SO_4820</i> | T | C | zinc ABC transporter | |
| | <i>SO_4820</i> | C | T | zinc ABC transporter | |
| | <i>SO_0623</i> | C | T | PepSY domain-containing protein | |
| | <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase | |
| | <i>SO_0768</i> | A | C | NAD(P)-dependent oxidoreductase | |
| | <i>SO_0787</i> | G | T | tellurite resistance TerB family protein | |
| | <i>azu</i> | T | C | azurin | |
| | <i>SO_0816</i> | G | A | HDOD domain-containing protein | |
| | <i>SO_0830</i> | G | A | alkaline phosphatase | |
| | <i>SO_0840</i> | G | A | biotin carboxylase containing protein | N-terminal domain- |
| | <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase | |
| | <i>SO_0937</i> | A | G | hypothetical protein | |
| | <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein | |
| | <i>SO_1006</i> | C | T | dienelactone hydrolase family protein | |
| | <i>SO_1074</i> | C | T | aromatic amino acid transport family protein | |
| | <i>SO_1137</i> | C | T | M48 family metalloproteinase | |
| | <i>SO_1137</i> | G | A | M48 family metalloproteinase | |

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|-----------------|---|---|---|
| <i>SO_1137</i> | A | G | M48 family metallopeptidase |
| <i>SO_1137</i> | T | A | M48 family metallopeptidase |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |
| <i>thyA</i> | A | G | thymidylate synthase |
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frr</i> | G | A | ribosome recycling factor |
| <i>SO_1657</i> | G | T | YdcF family protein |
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |
| <i>SO_t034</i> | G | A | tRNA-Cys |
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| <i>SO_1926</i> | G | A | citrate synthase |
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |

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|-----------------|---|---|---|
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxycetic acid(34) synthase CmoB |
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>tolQ</i> | C | A | protein TolQ |
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |

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|----------------|---|---|--|
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |
| <i>gshA</i> | C | T | glutamate--cysteine ligase |
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| <i>SO_3918</i> | G | A | S46 family peptidase |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 |

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|-----------------|---|---|---|
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 |
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>murA</i> | G | C | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC |
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding protein |
| <i>SO_3969</i> | A | G | OmpA family protein |
| <i>gene3723</i> | G | A | insulinase family protein |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein |
| <i>SO_4022</i> | C | T | pitrilysin family protein |
| <i>SO_4051</i> | C | A | HlyD family secretion protein |
| <i>SO_4051</i> | A | T | HlyD family secretion protein |
| <i>SO_4102</i> | A | G | PilW family protein |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL |
| <i>SO_4131</i> | G | A | outer membrane protein OmpK |
| <i>hslV</i> | A | T | ATP-dependent protease subunit HslV |
| <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain- containing protein |
| <i>SO_4262</i> | G | A | hypothetical protein |
| <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB |
| <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB |
| <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit |
| <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| <i>SO_4421</i> | G | A | DUF2986 domain-containing protein |
| <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase |
| <i>SO_4525</i> | A | G | patatin family protein |
| <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3- cyclohexene-1-carboxylic-acid synthase |
| <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1- carboxylate synthase |
| <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |

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|------------------|-----------------|---|---|---|
| | <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| | <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein YihA/YsxC |
| | <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| | <i>SO_4694</i> | A | T | TorF family putative porin |
| | <i>SO_4701</i> | T | C | hypothetical protein |
| | <i>SO_4701</i> | A | C | hypothetical protein |
| | <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| | <i>mnmG</i> | A | G | tRNA uridine-5-carboxymethylaminomethyl(34) synthesis enzyme MnmG |
| | <i>gene4455</i> | C | T | peptidase domain-containing ABC transporter |
| | <i>gene4523</i> | C | T | tandem-95 repeat protein |
| | <i>gene4526</i> | A | G | IS3 family transposase |
| 320d- | <i>trkA</i> | C | T | Trk system potassium transporter TrkA |
| Ferrihydrite-MR- | <i>SO_t001</i> | C | T | tRNA-Asp |
| 1_3 | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |
| | <i>yedF</i> | C | T | sulfurtransferase-like selenium metabolism protein YedF |
| | <i>SO_0135</i> | T | A | DUF333 domain-containing protein |
| | <i>rpsG</i> | A | G | 30S ribosomal protein S7 |
| | <i>SO_0298</i> | T | C | phosphoheptose isomerase |
| | <i>speF</i> | C | T | ornithine decarboxylase SpeF |
| | <i>speF</i> | G | T | ornithine decarboxylase SpeF |
| | <i>prpC</i> | C | T | 2-methylcitrate synthase |
| | <i>SO_0358</i> | G | C | RidA family protein |
| | <i>rho</i> | C | T | transcription termination factor Rho |
| | <i>yacG</i> | C | T | DNA gyrase inhibitor YacG |
| | <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| | <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |
| | <i>SO_0544</i> | A | G | CHASE domain-containing protein |
| | <i>SO_0544</i> | C | T | CHASE domain-containing protein |
| | <i>SO_4820</i> | T | C | zinc ABC transporter |
| | <i>SO_4820</i> | C | T | zinc ABC transporter |
| | <i>SO_0623</i> | C | T | PepSY domain-containing protein |
| | <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| | <i>SO_0768</i> | A | C | NAD(P)-dependent oxidoreductase |
| | <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| | <i>azu</i> | T | C | azurin |
| | <i>SO_0816</i> | G | A | HDOD domain-containing protein |

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|-----------------|---|---|---|
| <i>SO_0830</i> | G | A | alkaline phosphatase |
| <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain-containing protein |
| <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| <i>SO_0937</i> | A | G | hypothetical protein |
| <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein |
| <i>SO_1006</i> | C | T | dienelactone hydrolase family protein |
| <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| <i>SO_1137</i> | C | T | M48 family metalloproteinase |
| <i>SO_1137</i> | G | A | M48 family metalloproteinase |
| <i>SO_1137</i> | A | G | M48 family metalloproteinase |
| <i>SO_1137</i> | T | A | M48 family metalloproteinase |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |
| <i>thyA</i> | A | G | thymidylate synthase |
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frr</i> | G | A | ribosome recycling factor |
| <i>SO_1657</i> | G | T | YdcF family protein |
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |
| <i>SO_t034</i> | G | A | tRNA-Cys |
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |

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|-----------------|---|---|--|
| <i>SO_1926</i> | G | A | citrate synthase |
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>tolQ</i> | C | A | protein TolQ |
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |

| | | | |
|----------------|---|---|--|
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |
| <i>gshA</i> | C | T | glutamate--cysteine ligase |
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |

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|-----------------|---|---|--|
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| <i>SO_3918</i> | G | A | S46 family peptidase |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 |
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 |
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>murA</i> | G | C | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC |
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding protein |
| <i>SO_3969</i> | A | G | OmpA family protein |
| <i>gene3723</i> | G | A | insulinase family protein |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein |
| <i>SO_4022</i> | C | T | pitrilysin family protein |
| <i>SO_4051</i> | C | A | HlyD family secretion protein |
| <i>SO_4051</i> | A | T | HlyD family secretion protein |
| <i>SO_4102</i> | A | G | PilW family protein |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL |
| <i>SO_4131</i> | G | A | outer membrane protein OmpK |
| <i>hslV</i> | A | T | ATP-dependent protease subunit HslV |
| <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain-containing protein |
| <i>SO_4262</i> | G | A | hypothetical protein |
| <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB |
| <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB |
| <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit |

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|------------------|-----------------|---|---|---|
| | <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| | <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| | <i>SO_4421</i> | G | A | DUF2986 domain-containing protein |
| | <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase |
| | <i>SO_4525</i> | A | G | patatin family protein |
| | <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylic-acid synthase |
| | <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate synthase |
| | <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |
| | <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| | <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein YihA/YsxC |
| | <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| | <i>SO_4694</i> | A | T | TorF family putative porin |
| | <i>SO_4701</i> | T | C | hypothetical protein |
| | <i>SO_4701</i> | A | C | hypothetical protein |
| | <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| | <i>mnmG</i> | A | G | tRNA uridine-5-carboxymethylaminomethyl(34) synthesis enzyme MnmG |
| | <i>gene4455</i> | C | T | peptidase domain-containing ABC transporter |
| | <i>gene4523</i> | C | T | tandem-95 repeat protein |
| | <i>gene4526</i> | A | G | IS3 family transposase |
| 320d- | <i>trkA</i> | C | T | Trk system potassium transporter TrkA |
| Ferrihydrite-MR- | <i>SO_t001</i> | C | T | tRNA-Asp |
| 1_2 | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |
| | <i>yedF</i> | C | T | sulfurtransferase-like selenium metabolism protein YedF |
| | <i>SO_0135</i> | T | A | DUF333 domain-containing protein |
| | <i>rpsG</i> | A | G | 30S ribosomal protein S7 |
| | <i>SO_0298</i> | T | C | phosphoheptose isomerase |
| | <i>speF</i> | C | T | ornithine decarboxylase SpeF |
| | <i>speF</i> | G | T | ornithine decarboxylase SpeF |
| | <i>prpC</i> | C | T | 2-methylcitrate synthase |
| | <i>SO_0358</i> | G | C | RidA family protein |
| | <i>rho</i> | C | T | transcription termination factor Rho |
| | <i>yacG</i> | C | T | DNA gyrase inhibitor YacG |
| | <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| | <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |

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|-----------------|---|---|---|
| <i>SO_0544</i> | A | G | CHASE domain-containing protein |
| <i>SO_0544</i> | C | T | CHASE domain-containing protein |
| <i>SO_4820</i> | T | C | zinc ABC transporter |
| <i>SO_4820</i> | C | T | zinc ABC transporter |
| <i>SO_0623</i> | C | T | PepSY domain-containing protein |
| <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| <i>SO_0768</i> | A | C | NAD(P)-dependent oxidoreductase |
| <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| <i>azu</i> | T | C | azurin |
| <i>SO_0816</i> | G | A | HDOD domain-containing protein |
| <i>SO_0830</i> | G | A | alkaline phosphatase |
| <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain-containing protein |
| <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| <i>SO_0937</i> | A | G | hypothetical protein |
| <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein |
| <i>SO_1006</i> | C | T | dienelactone hydrolase family protein |
| <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| <i>SO_1137</i> | C | T | M48 family metallopeptidase |
| <i>SO_1137</i> | G | A | M48 family metallopeptidase |
| <i>SO_1137</i> | A | G | M48 family metallopeptidase |
| <i>SO_1137</i> | T | A | M48 family metallopeptidase |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |
| <i>thyA</i> | A | G | thymidylate synthase |
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frr</i> | G | A | ribosome recycling factor |
| <i>SO_1651</i> | C | G | DEAD/DEAH box helicase |
| <i>SO_1657</i> | G | T | YdcF family protein |

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|-----------------|---|---|--|
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |
| <i>SO_t034</i> | G | A | tRNA-Cys |
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| <i>SO_1926</i> | G | A | citrate synthase |
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |

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|----------------|---|---|--|
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>tolQ</i> | C | A | protein TolQ |
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L-altrosamine transaminase |
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L-altrosamine transaminase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |

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|-----------------|---|---|--|
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |
| <i>gshA</i> | C | T | glutamate--cysteine ligase |
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| <i>SO_3918</i> | G | A | S46 family peptidase |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 |
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 |
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>murA</i> | G | C | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC |
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding protein |
| <i>SO_3969</i> | A | G | OmpA family protein |
| <i>gene3723</i> | G | A | insulinase family protein |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein |
| <i>SO_4022</i> | C | T | pitrilysin family protein |
| <i>SO_4051</i> | C | A | HlyD family secretion protein |
| <i>SO_4051</i> | A | T | HlyD family secretion protein |
| <i>SO_4102</i> | A | G | PilW family protein |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL |

| | | | | |
|------------------|-----------------|---|---|---|
| | <i>mshL</i> | C | T | pilus (MSHA type) biogenesis protein MshL |
| | <i>SO_4131</i> | G | A | outer membrane protein OmpK |
| | <i>hslV</i> | A | T | ATP-dependent protease subunit HslV |
| | <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain-containing protein |
| | <i>SO_4262</i> | G | A | hypothetical protein |
| | <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB |
| | <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB |
| | <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit |
| | <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| | <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| | <i>SO_4421</i> | G | A | DUF2986 domain-containing protein |
| | <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase |
| | <i>SO_4525</i> | A | G | patatin family protein |
| | <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylic-acid synthase |
| | <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate synthase |
| | <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |
| | <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| | <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein YihA/YsxC |
| | <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| | <i>SO_4694</i> | A | T | TorF family putative porin |
| | <i>SO_4701</i> | T | C | hypothetical protein |
| | <i>SO_4701</i> | A | C | hypothetical protein |
| | <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| | <i>mmnG</i> | A | G | tRNA uridine-5-carboxymethylaminomethyl(34) synthesis enzyme MnmG |
| | <i>gene4455</i> | C | T | peptidase domain-containing ABC transporter |
| | <i>gene4523</i> | C | T | tandem-95 repeat protein |
| | <i>gene4526</i> | A | G | IS3 family transposase |
| 320d- | <i>trkA</i> | C | T | Trk system potassium transporter TrkA |
| Ferrihydrite-MR- | <i>SO_t001</i> | C | T | tRNA-Asp |
| 1_1 | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |

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|-----------------|---|---|---|
| <i>yedF</i> | C | T | sulfurtransferase-like selenium metabolism protein YedF |
| <i>SO_0135</i> | T | A | DUF333 domain-containing protein |
| <i>rpsG</i> | A | G | 30S ribosomal protein S7 |
| <i>SO_0298</i> | T | C | phosphoheptose isomerase |
| <i>speF</i> | C | T | ornithine decarboxylase SpeF |
| <i>speF</i> | G | T | ornithine decarboxylase SpeF |
| <i>prpC</i> | C | T | 2-methylcitrate synthase |
| <i>SO_0358</i> | G | C | RidA family protein |
| <i>rho</i> | C | T | transcription termination factor Rho |
| <i>yacG</i> | C | T | DNA gyrase inhibitor YacG |
| <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |
| <i>SO_0544</i> | A | G | CHASE domain-containing protein |
| <i>SO_0544</i> | C | T | CHASE domain-containing protein |
| <i>SO_4820</i> | T | C | zinc ABC transporter |
| <i>SO_4820</i> | C | T | zinc ABC transporter |
| <i>SO_0623</i> | C | T | PepSY domain-containing protein |
| <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| <i>SO_0768</i> | A | C | NAD(P)-dependent oxidoreductase |
| <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| <i>azu</i> | T | C | azurin |
| <i>SO_0816</i> | G | A | HDOD domain-containing protein |
| <i>SO_0830</i> | G | A | alkaline phosphatase |
| <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain-containing protein |
| <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| <i>SO_0937</i> | A | G | hypothetical protein |
| <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein |
| <i>SO_1006</i> | C | T | dienelactone hydrolase family protein |
| <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| <i>SO_1137</i> | C | T | M48 family metallopeptidase |
| <i>SO_1137</i> | G | A | M48 family metallopeptidase |
| <i>SO_1137</i> | A | G | M48 family metallopeptidase |
| <i>SO_1137</i> | T | A | M48 family metallopeptidase |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |

| | | | |
|----------------|---|---|---|
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |
| <i>thyA</i> | A | G | thymidylate synthase |
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frs</i> | G | A | ribosome recycling factor |
| <i>SO_1657</i> | G | T | YdcF family protein |
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |
| <i>SO_t034</i> | G | A | tRNA-Cys |
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| <i>SO_1926</i> | G | A | citrate synthase |
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |

| | | | |
|-----------------|---|---|--|
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>tolQ</i> | C | A | protein TolQ |
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |

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|----------------|---|---|--|
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |
| <i>gshA</i> | C | T | glutamate--cysteine ligase |
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| <i>SO_3918</i> | G | A | S46 family peptidase |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 |
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 |
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine carboxyvinyltransferase |

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|-----------------|---|---|---|
| <i>murA</i> | G | C | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC |
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding protein |
| <i>SO_3969</i> | A | G | OmpA family protein |
| <i>gene3723</i> | G | A | insulinase family protein |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein |
| <i>SO_4022</i> | C | T | pitrilysin family protein |
| <i>SO_4051</i> | C | A | HlyD family secretion protein |
| <i>SO_4051</i> | A | T | HlyD family secretion protein |
| <i>SO_4102</i> | A | G | PilW family protein |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL |
| <i>SO_4131</i> | G | A | outer membrane protein OmpK |
| <i>hslV</i> | A | T | ATP-dependent protease subunit HslV |
| <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain-containing protein |
| <i>SO_4262</i> | G | A | hypothetical protein |
| <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB |
| <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB |
| <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit |
| <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| <i>SO_4421</i> | G | A | DUF2986 domain-containing protein |
| <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase |
| <i>SO_4525</i> | A | G | patatin family protein |
| <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylic-acid synthase |
| <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate synthase |
| <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |
| <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein YihA/YsxC |
| <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| <i>SO_4694</i> | A | T | TorF family putative porin |
| <i>SO_4701</i> | T | C | hypothetical protein |
| <i>SO_4701</i> | A | C | hypothetical protein |

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|--------------|-----------------|---|---|--|
| | <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| | <i>mmnG</i> | A | G | tRNA uridine-5- carboxymethylaminomethyl(34) synthesis enzyme MnmG |
| | <i>gene4455</i> | C | T | peptidase domain-containing ABC transporter |
| | <i>gene4523</i> | C | T | tandem-95 repeat protein |
| | <i>gene4526</i> | A | G | IS3 family transposase |
| 320d-Oxygen- | <i>trkA</i> | C | T | Trk system potassium transporter TrkA |
| MR-1_3 | <i>SO_t001</i> | C | T | tRNA-Asp |
| | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |
| | <i>yedF</i> | C | T | sulfurtransferase-like selenium metabolism protein YedF |
| | <i>SO_0135</i> | T | A | DUF333 domain-containing protein |
| | <i>rpsG</i> | A | G | 30S ribosomal protein S7 |
| | <i>SO_0298</i> | T | C | phosphoheptose isomerase |
| | <i>speF</i> | C | T | ornithine decarboxylase SpeF |
| | <i>speF</i> | G | T | ornithine decarboxylase SpeF |
| | <i>prpC</i> | C | T | 2-methylcitrate synthase |
| | <i>SO_0358</i> | G | C | RidA family protein |
| | <i>rho</i> | C | T | transcription termination factor Rho |
| | <i>yacG</i> | C | T | DNA gyrase inhibitor YacG |
| | <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| | <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |
| | <i>SO_0544</i> | A | G | CHASE domain-containing protein |
| | <i>SO_0544</i> | C | T | CHASE domain-containing protein |
| | <i>SO_4820</i> | T | C | zinc ABC transporter |
| | <i>SO_4820</i> | C | T | zinc ABC transporter |
| | <i>SO_0623</i> | C | T | PepSY domain-containing protein |
| | <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| | <i>SO_0768</i> | A | C | NAD(P)-dependent oxidoreductase |
| | <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| | <i>azu</i> | T | C | azurin |
| | <i>SO_0816</i> | G | A | HDOD domain-containing protein |
| | <i>SO_0830</i> | G | A | alkaline phosphatase |
| | <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain- containing protein |
| | <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| | <i>SO_0937</i> | A | G | hypothetical protein |
| | <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein |
| | <i>SO_1006</i> | C | T | dienelactone hydrolase family protein |

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|-----------------|---|---|---|
| <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| <i>SO_1137</i> | C | T | M48 family metallopeptidase |
| <i>SO_1137</i> | G | A | M48 family metallopeptidase |
| <i>SO_1137</i> | A | G | M48 family metallopeptidase |
| <i>SO_1137</i> | T | A | M48 family metallopeptidase |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |
| <i>thyA</i> | A | G | thymidylate synthase |
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frt</i> | G | A | ribosome recycling factor |
| <i>SO_1657</i> | G | T | YdcF family protein |
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |
| <i>SO_t034</i> | G | A | tRNA-Cys |
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| <i>SO_1926</i> | G | A | citrate synthase |
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |

| | | | |
|-----------------|---|---|--|
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>tolQ</i> | C | A | protein TolQ |
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |

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|----------------|---|---|--|
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |
| <i>gshA</i> | C | T | glutamate--cysteine ligase |
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |

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|-----------------|---|---|---|----|
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase | |
| <i>SO_3918</i> | G | A | S46 family peptidase | |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 | |
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 | |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 | |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 | |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 | |
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 | |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine carboxyvinyltransferase | 1- |
| <i>murA</i> | G | C | UDP-N-acetylglucosamine carboxyvinyltransferase | 1- |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC | |
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding protein | |
| <i>SO_3969</i> | A | G | OmpA family protein | |
| <i>gene3723</i> | G | A | insulinase family protein | |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein | |
| <i>SO_4022</i> | C | T | pitrilysin family protein | |
| <i>SO_4051</i> | C | A | HlyD family secretion protein | |
| <i>SO_4051</i> | A | T | HlyD family secretion protein | |
| <i>SO_4102</i> | A | G | PilW family protein | |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL | |
| <i>SO_4131</i> | G | A | outer membrane protein OmpK | |
| <i>hslV</i> | A | T | ATP-dependent protease subunit HslV | |
| <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain- containing protein | |
| <i>SO_4262</i> | G | A | hypothetical protein | |
| <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB | |
| <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB | |
| <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit | |
| <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor | |
| <i>SO_4368</i> | G | A | phosphopantetheine-binding protein | |
| <i>SO_4421</i> | G | A | DUF2986 domain-containing protein | |
| <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase | |
| <i>SO_4525</i> | A | G | patatin family protein | |
| <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3- cyclohexene-1-carboxylic-acid synthase | |

| | | | | |
|--------------------|-----------------|---|---|---|
| | <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate synthase |
| | <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |
| | <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| | <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein YihA/YsxC |
| | <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| | <i>SO_4694</i> | A | T | TorF family putative porin |
| | <i>SO_4701</i> | T | C | hypothetical protein |
| | <i>SO_4701</i> | A | C | hypothetical protein |
| | <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| | <i>mnmG</i> | A | G | tRNA uridine-5-carboxymethylaminomethyl(34) synthesis enzyme MnmG |
| | <i>gene4455</i> | C | T | peptidase domain-containing ABC transporter |
| | <i>gene4523</i> | C | T | tandem-95 repeat protein |
| | <i>gene4526</i> | A | G | IS3 family transposase |
| 320d-Oxygen-MR-1_2 | <i>trkA</i> | C | T | Trk system potassium transporter TrkA |
| | <i>SO_t001</i> | C | T | tRNA-Asp |
| | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |
| | <i>yedF</i> | C | T | sulfurtransferase-like selenium metabolism protein YedF |
| | <i>SO_0135</i> | T | A | DUF333 domain-containing protein |
| | <i>rpsG</i> | A | G | 30S ribosomal protein S7 |
| | <i>SO_0298</i> | T | C | phosphoheptose isomerase |
| | <i>speF</i> | C | T | ornithine decarboxylase SpeF |
| | <i>speF</i> | G | T | ornithine decarboxylase SpeF |
| | <i>prpC</i> | C | T | 2-methylcitrate synthase |
| | <i>SO_0358</i> | G | C | RidA family protein |
| | <i>rho</i> | C | T | transcription termination factor Rho |
| | <i>yacG</i> | C | T | DNA gyrase inhibitor YacG |
| | <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| | <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |
| | <i>SO_0544</i> | A | G | CHASE domain-containing protein |
| | <i>SO_0544</i> | C | T | CHASE domain-containing protein |
| | <i>SO_4820</i> | T | C | zinc ABC transporter |
| | <i>SO_4820</i> | C | T | zinc ABC transporter |
| | <i>SO_0623</i> | C | T | PepSY domain-containing protein |
| | <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| | <i>SO_0768</i> | A | C | NAD(P)-dependent oxidoreductase |

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|-----------------|---|---|---|
| <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| <i>azu</i> | T | C | azurin |
| <i>SO_0816</i> | G | A | HDOD domain-containing protein |
| <i>SO_0830</i> | G | A | alkaline phosphatase |
| <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain-containing protein |
| <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| <i>SO_0937</i> | A | G | hypothetical protein |
| <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein |
| <i>SO_1006</i> | C | T | dienelactone hydrolase family protein |
| <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| <i>SO_1137</i> | C | T | M48 family metalloproteinase |
| <i>SO_1137</i> | G | A | M48 family metalloproteinase |
| <i>SO_1137</i> | A | G | M48 family metalloproteinase |
| <i>SO_1137</i> | T | A | M48 family metalloproteinase |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |
| <i>thyA</i> | A | G | thymidylate synthase |
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frs</i> | G | A | ribosome recycling factor |
| <i>SO_1657</i> | G | T | YdcF family protein |
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |

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|-----------------|---|---|--|
| <i>SO_t034</i> | G | A | tRNA-Cys |
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| <i>SO_1926</i> | G | A | citrate synthase |
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>tolQ</i> | C | A | protein TolQ |
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |

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|----------------|---|---|--|
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |

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|-----------------|---|---|--|
| <i>gshA</i> | C | T | glutamate--cysteine ligase |
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| <i>SO_3918</i> | G | A | S46 family peptidase |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 |
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 |
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>murA</i> | G | C | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC |
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding protein |
| <i>SO_3969</i> | A | G | OmpA family protein |
| <i>gene3723</i> | G | A | insulinase family protein |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein |
| <i>SO_4022</i> | C | T | pitrilysin family protein |
| <i>SO_4051</i> | C | A | HlyD family secretion protein |
| <i>SO_4051</i> | A | T | HlyD family secretion protein |
| <i>SO_4102</i> | A | G | PilW family protein |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL |
| <i>SO_4131</i> | G | A | outer membrane protein OmpK |
| <i>hslV</i> | A | T | ATP-dependent protease subunit HslV |
| <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain-containing protein |
| <i>SO_4262</i> | G | A | hypothetical protein |
| <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB |

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|--------------------|-----------------|---|---|---|
| | <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB |
| | <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit |
| | <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| | <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| | <i>SO_4421</i> | G | A | DUF2986 domain-containing protein |
| | <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase |
| | <i>SO_4525</i> | A | G | patatin family protein |
| | <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylic-acid synthase |
| | <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate synthase |
| | <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |
| | <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| | <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein YihA/YsxC |
| | <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| | <i>SO_4694</i> | A | T | TorF family putative porin |
| | <i>SO_4701</i> | T | C | hypothetical protein |
| | <i>SO_4701</i> | A | C | hypothetical protein |
| | <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| | <i>mmnG</i> | A | G | tRNA uridine-5-carboxymethylaminomethyl(34) synthesis enzyme MnmG |
| | <i>gene4455</i> | C | T | peptidase domain-containing ABC transporter |
| | <i>gene4523</i> | C | T | tandem-95 repeat protein |
| | <i>gene4526</i> | A | G | IS3 family transposase |
| 320d-Oxygen-MR-1_1 | <i>trkA</i> | C | T | Trk system potassium transporter TrkA |
| | <i>SO_t001</i> | C | T | tRNA-Asp |
| | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |
| | <i>yedF</i> | C | T | sulfurtransferase-like selenium metabolism protein YedF |
| | <i>SO_0127</i> | C | T | metal transporter |
| | <i>SO_0135</i> | T | A | DUF333 domain-containing protein |
| | <i>rpsG</i> | A | G | 30S ribosomal protein S7 |
| | <i>SO_0298</i> | T | C | phosphoheptose isomerase |
| | <i>speF</i> | C | T | ornithine decarboxylase SpeF |
| | <i>speF</i> | G | T | ornithine decarboxylase SpeF |
| | <i>prpC</i> | C | T | 2-methylcitrate synthase |

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|-----------------|---|---|---|
| <i>SO_0358</i> | G | C | RidA family protein |
| <i>rho</i> | C | T | transcription termination factor Rho |
| <i>yacG</i> | C | T | DNA gyrase inhibitor YacG |
| <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |
| <i>SO_0544</i> | A | G | CHASE domain-containing protein |
| <i>SO_0544</i> | C | T | CHASE domain-containing protein |
| <i>SO_4820</i> | T | C | zinc ABC transporter |
| <i>SO_4820</i> | C | T | zinc ABC transporter |
| <i>SO_0587</i> | T | C | glycerophosphodiester phosphodiesterase |
| <i>SO_0623</i> | C | T | PepSY domain-containing protein |
| <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| <i>SO_0680</i> | C | T | tape measure protein |
| <i>SO_0768</i> | A | C | NAD(P)-dependent oxidoreductase |
| <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| <i>azu</i> | T | C | azurin |
| <i>SO_0816</i> | G | A | HDOD domain-containing protein |
| <i>SO_0830</i> | G | A | alkaline phosphatase |
| <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain-containing protein |
| <i>SO_0844</i> | A | G | hypothetical protein |
| <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| <i>SO_0937</i> | A | G | hypothetical protein |
| <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein |
| <i>SO_1006</i> | C | T | dienelactone hydrolase family protein |
| <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| <i>SO_1137</i> | C | T | M48 family metallopeptidase |
| <i>SO_1137</i> | G | A | M48 family metallopeptidase |
| <i>SO_1137</i> | A | G | M48 family metallopeptidase |
| <i>SO_1137</i> | T | A | M48 family metallopeptidase |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |
| <i>thyA</i> | A | G | thymidylate synthase |

| | | | |
|----------------|---|---|---|
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |
| <i>SO_1408</i> | A | G | DEAD/DEAH box helicase family protein |
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frr</i> | G | A | ribosome recycling factor |
| <i>SO_1657</i> | G | T | YdcF family protein |
| <i>SO_1670</i> | G | A | fumarylacetoacetate hydrolase family protein |
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |
| <i>SO_t034</i> | G | A | tRNA-Cys |
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| <i>SO_1926</i> | G | A | citrate synthase |
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |

| | | | |
|-----------------|---|---|--|
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>SO_t058</i> | C | T | tRNA-Lys |
| <i>tolQ</i> | C | A | protein TolQ |
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3119</i> | T | C | hypothetical protein |
| <i>SO_3121</i> | T | C | CIA30 family protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |

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|----------------|---|---|--|
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L-altrosamine transaminase |
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L-altrosamine transaminase |
| <i>SO_3382</i> | T | C | SDR family NAD(P)-dependent oxidoreductase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |
| <i>gshA</i> | C | T | glutamate--cysteine ligase |
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| <i>SO_3918</i> | G | A | S46 family peptidase |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 |
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 |

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|-----------------|---|---|---|
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>murA</i> | G | C | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC |
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding protein |
| <i>SO_3969</i> | A | G | OmpA family protein |
| <i>gene3723</i> | G | A | insulinase family protein |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein |
| <i>SO_4022</i> | C | T | pitrilysin family protein |
| <i>SO_4051</i> | C | A | HlyD family secretion protein |
| <i>SO_4051</i> | A | T | HlyD family secretion protein |
| <i>SO_4102</i> | A | G | PilW family protein |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL |
| <i>SO_4131</i> | G | A | outer membrane protein OmpK |
| <i>hslV</i> | A | T | ATP-dependent protease subunit HslV |
| <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain-containing protein |
| <i>SO_4262</i> | G | A | hypothetical protein |
| <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB |
| <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB |
| <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit |
| <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| <i>SO_4421</i> | G | A | DUF2986 domain-containing protein |
| <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase |
| <i>SO_4524</i> | C | T | LysR family transcriptional regulator |
| <i>SO_4525</i> | A | G | patatin family protein |
| <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylic-acid synthase |
| <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate synthase |
| <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |
| <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| <i>gene4350</i> | T | C | putative sulfate exporter family transporter |
| <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein |

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|----------------|-----------------|---|---|--|
| | | | | YihA/YsxC |
| | <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| | <i>SO_4694</i> | A | T | TorF family putative porin |
| | <i>SO_4701</i> | T | C | hypothetical protein |
| | <i>SO_4701</i> | A | C | hypothetical protein |
| | <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| | <i>mnmG</i> | A | G | tRNA uridine-5- carboxymethylaminomethyl(34) synthesis enzyme MnmG |
| | <i>gene4455</i> | C | T | peptidase domain-containing ABC transporter |
| | <i>gene4523</i> | C | T | tandem-95 repeat protein |
| | <i>gene4526</i> | A | G | IS3 family transposase |
| 320d-Anaerobic | <i>trkA</i> | C | T | Trk system potassium transporter TrkA |
| control-MR-1_1 | <i>SO_t001</i> | C | T | tRNA-Asp |
| | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |
| | <i>yedF</i> | C | T | sulfurtransferase-like selenium metabolism protein YedF |
| | <i>SO_0135</i> | T | A | DUF333 domain-containing protein |
| | <i>rpsG</i> | A | G | 30S ribosomal protein S7 |
| | <i>SO_0298</i> | T | C | phosphoheptose isomerase |
| | <i>speF</i> | C | T | ornithine decarboxylase SpeF |
| | <i>speF</i> | G | T | ornithine decarboxylase SpeF |
| | <i>prpC</i> | C | T | 2-methylcitrate synthase |
| | <i>SO_0358</i> | G | C | RidA family protein |
| | <i>rho</i> | C | T | transcription termination factor Rho |
| | <i>yacG</i> | C | T | DNA gyrase inhibitor YacG |
| | <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| | <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |
| | <i>SO_0544</i> | A | G | CHASE domain-containing protein |
| | <i>SO_0544</i> | C | T | CHASE domain-containing protein |
| | <i>SO_4820</i> | T | C | zinc ABC transporter |
| | <i>SO_4820</i> | C | T | zinc ABC transporter |
| | <i>SO_0623</i> | C | T | PepSY domain-containing protein |
| | <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| | <i>SO_0768</i> | A | C | NAD(P)-dependent oxidoreductase |
| | <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| | <i>azu</i> | T | C | azurin |
| | <i>SO_0816</i> | G | A | HDOD domain-containing protein |
| | <i>SO_0830</i> | G | A | alkaline phosphatase |
| | <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain- |

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|-----------------|---|---|---|
| | | | containing protein |
| <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| <i>SO_0937</i> | A | G | hypothetical protein |
| <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein |
| <i>SO_1006</i> | C | T | dienelactone hydrolase family protein |
| <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| <i>SO_1137</i> | C | T | M48 family metallopeptidase |
| <i>SO_1137</i> | G | A | M48 family metallopeptidase |
| <i>SO_1137</i> | A | G | M48 family metallopeptidase |
| <i>SO_1137</i> | T | A | M48 family metallopeptidase |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |
| <i>SO_1277</i> | G | A | peptide MFS transporter |
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |
| <i>thyA</i> | A | G | thymidylate synthase |
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frr</i> | G | A | ribosome recycling factor |
| <i>SO_1657</i> | G | T | YdcF family protein |
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |
| <i>SO_t034</i> | G | A | tRNA-Cys |
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| <i>SO_1926</i> | G | A | citrate synthase |

| | | | |
|-----------------|---|---|--|
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>tolQ</i> | C | A | protein TolQ |
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |

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|----------------|---|---|--|
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| <i>SO_3069</i> | C | A | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |
| <i>gshA</i> | C | T | glutamate--cysteine ligase |
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |

| | | | |
|-----------------|---|---|--|
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| <i>SO_3918</i> | G | A | S46 family peptidase |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 |
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 |
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>murA</i> | G | C | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC |
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding protein |
| <i>SO_3969</i> | A | G | OmpA family protein |
| <i>gene3723</i> | G | A | insulinase family protein |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein |
| <i>SO_4022</i> | C | T | pitrilysin family protein |
| <i>SO_4051</i> | C | A | HlyD family secretion protein |
| <i>SO_4051</i> | A | T | HlyD family secretion protein |
| <i>SO_4102</i> | A | G | PilW family protein |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL |
| <i>SO_4131</i> | G | A | outer membrane protein OmpK |
| <i>hslV</i> | A | T | ATP-dependent protease subunit HslV |
| <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain-containing protein |
| <i>SO_4262</i> | G | A | hypothetical protein |
| <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB |
| <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB |
| <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit |

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|-------------------------------|-----------------|---|---|---|
| | <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| | <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| | <i>SO_4421</i> | G | A | DUF2986 domain-containing protein |
| | <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase |
| | <i>SO_4525</i> | A | G | patatin family protein |
| | <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylic-acid synthase |
| | <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate synthase |
| | <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |
| | <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| | <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein YihA/YsxC |
| | <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| | <i>SO_4694</i> | A | T | TorF family putative porin |
| | <i>SO_4701</i> | T | C | hypothetical protein |
| | <i>SO_4701</i> | A | C | hypothetical protein |
| | <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| | <i>mmnG</i> | A | G | tRNA uridine-5-carboxymethylaminomethyl(34) synthesis enzyme MnmG |
| | <i>gene4455</i> | C | T | peptidase domain-containing ABC transporter |
| | <i>gene4523</i> | C | T | tandem-95 repeat protein |
| | <i>gene4526</i> | A | G | IS3 family transposase |
| 320d-Anaerobic control-MR-1_3 | <i>trkA</i> | C | T | Trk system potassium transporter TrkA |
| | <i>SO_t001</i> | C | T | tRNA-Asp |
| | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |
| | <i>yedF</i> | C | T | sulfurtransferase-like selenium metabolism protein YedF |
| | <i>SO_0135</i> | T | A | DUF333 domain-containing protein |
| | <i>rpsG</i> | A | G | 30S ribosomal protein S7 |
| | <i>SO_0298</i> | T | C | phosphoheptose isomerase |
| | <i>speF</i> | C | T | ornithine decarboxylase SpeF |
| | <i>speF</i> | G | T | ornithine decarboxylase SpeF |
| | <i>prpC</i> | C | T | 2-methylcitrate synthase |
| | <i>SO_0358</i> | G | C | RidA family protein |
| | <i>rho</i> | C | T | transcription termination factor Rho |
| | <i>yacG</i> | C | T | DNA gyrase inhibitor YacG |
| | <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| | <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |

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|-----------------|---|---|---|
| <i>SO_0544</i> | A | G | CHASE domain-containing protein |
| <i>SO_0544</i> | C | T | CHASE domain-containing protein |
| <i>SO_4820</i> | T | C | zinc ABC transporter |
| <i>SO_4820</i> | C | T | zinc ABC transporter |
| <i>SO_0623</i> | C | T | PepSY domain-containing protein |
| <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| <i>SO_0768</i> | A | C | NAD(P)-dependent oxidoreductase |
| <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| <i>azu</i> | T | C | azurin |
| <i>SO_0816</i> | G | A | HDOD domain-containing protein |
| <i>SO_0830</i> | G | A | alkaline phosphatase |
| <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain-containing protein |
| <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| <i>SO_0937</i> | A | G | hypothetical protein |
| <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein |
| <i>SO_1006</i> | C | T | dienelactone hydrolase family protein |
| <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| <i>SO_1137</i> | C | T | M48 family metallopeptidase |
| <i>SO_1137</i> | G | A | M48 family metallopeptidase |
| <i>SO_1137</i> | A | G | M48 family metallopeptidase |
| <i>SO_1137</i> | T | A | M48 family metallopeptidase |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |
| <i>thyA</i> | A | G | thymidylate synthase |
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frr</i> | G | A | ribosome recycling factor |
| <i>SO_1657</i> | G | T | YdcF family protein |
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |

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|-----------------|---|---|--|
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |
| <i>SO_t034</i> | G | A | tRNA-Cys |
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| <i>SO_1926</i> | G | A | citrate synthase |
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein |

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|----------------|---|---|--|
| | | | transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>tolQ</i> | C | A | protein TolQ |
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L-altrosamine transaminase |
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L-altrosamine transaminase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |

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|-----------------|---|---|--|
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |
| <i>gshA</i> | C | T | glutamate--cysteine ligase |
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| <i>SO_3918</i> | G | A | S46 family peptidase |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 |
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 |
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>murA</i> | G | C | UDP-N-acetylglucosamine 1-carboxyvinyltransferase |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC |
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding protein |
| <i>SO_3969</i> | A | G | OmpA family protein |
| <i>gene3723</i> | G | A | insulinase family protein |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein |
| <i>SO_4022</i> | C | T | pitrilysin family protein |
| <i>SO_4051</i> | C | A | HlyD family secretion protein |
| <i>SO_4051</i> | A | T | HlyD family secretion protein |
| <i>SO_4102</i> | A | G | PilW family protein |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL |
| <i>SO_4131</i> | G | A | outer membrane protein OmpK |

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|----------------|-----------------|---|---|---|
| | <i>hslV</i> | A | T | ATP-dependent protease subunit HslV |
| | <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain-containing protein |
| | <i>SO_4262</i> | G | A | hypothetical protein |
| | <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB |
| | <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB |
| | <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit |
| | <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| | <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| | <i>SO_4421</i> | G | A | DUF2986 domain-containing protein |
| | <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase |
| | <i>SO_4525</i> | A | G | patatin family protein |
| | <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylic-acid synthase |
| | <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate synthase |
| | <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |
| | <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| | <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein YihA/YsxC |
| | <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| | <i>SO_4694</i> | A | T | TorF family putative porin |
| | <i>SO_4701</i> | T | C | hypothetical protein |
| | <i>SO_4701</i> | A | C | hypothetical protein |
| | <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| | <i>mmnG</i> | A | G | tRNA uridine-5-carboxymethylaminomethyl(34) synthesis enzyme MnmG |
| | <i>gene4455</i> | C | T | peptidase domain-containing ABC transporter |
| | <i>gene4523</i> | C | T | tandem-95 repeat protein |
| | <i>gene4526</i> | A | G | IS3 family transposase |
| 320d-Anaerobic | <i>trkA</i> | C | T | Trk system potassium transporter TrkA |
| control-MR-1_2 | <i>SO_t001</i> | C | T | tRNA-Asp |
| | <i>SO_0054</i> | A | G | NAD(P)/FAD-dependent oxidoreductase |
| | <i>yedF</i> | C | T | sulfurtransferase-like selenium metabolism protein YedF |
| | <i>SO_0135</i> | T | A | DUF333 domain-containing protein |

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|-----------------|---|---|---|
| <i>rpsG</i> | A | G | 30S ribosomal protein S7 |
| <i>SO_0298</i> | T | C | phosphoheptose isomerase |
| <i>speF</i> | C | T | ornithine decarboxylase SpeF |
| <i>speF</i> | G | T | ornithine decarboxylase SpeF |
| <i>prpC</i> | C | T | 2-methylcitrate synthase |
| <i>SO_0358</i> | G | C | RidA family protein |
| <i>rho</i> | C | T | transcription termination factor Rho |
| <i>yacG</i> | C | T | DNA gyrase inhibitor YacG |
| <i>SO_0428</i> | G | A | patatin-like phospholipase family protein |
| <i>SO_0487</i> | T | A | ABC transporter ATP-binding protein |
| <i>SO_0544</i> | A | G | CHASE domain-containing protein |
| <i>SO_0544</i> | C | T | CHASE domain-containing protein |
| <i>SO_4820</i> | T | C | zinc ABC transporter |
| <i>SO_4820</i> | C | T | zinc ABC transporter |
| <i>SO_0623</i> | C | T | PepSY domain-containing protein |
| <i>thpR</i> | A | T | RNA 2',3'-cyclic phosphodiesterase |
| <i>SO_0768</i> | A | C | NAD(P)-dependent oxidoreductase |
| <i>SO_0787</i> | G | T | tellurite resistance TerB family protein |
| <i>azu</i> | T | C | azurin |
| <i>SO_0816</i> | G | A | HDOD domain-containing protein |
| <i>SO_0830</i> | G | A | alkaline phosphatase |
| <i>SO_0840</i> | G | A | biotin carboxylase N-terminal domain-containing protein |
| <i>SO_0920</i> | A | G | GNAT family N-acetyltransferase |
| <i>SO_0937</i> | A | G | hypothetical protein |
| <i>SO_0996</i> | C | T | lactoylglutathione lyase family protein |
| <i>SO_1006</i> | C | T | dienelactone hydrolase family protein |
| <i>SO_1074</i> | C | T | aromatic amino acid transport family protein |
| <i>SO_1137</i> | C | T | M48 family metallopeptidase |
| <i>SO_1137</i> | G | A | M48 family metallopeptidase |
| <i>SO_1137</i> | A | G | M48 family metallopeptidase |
| <i>SO_1137</i> | T | A | M48 family metallopeptidase |
| <i>gene1050</i> | A | G | hypothetical protein |
| <i>rsfS</i> | A | G | ribosome silencing factor |
| <i>SO_t019</i> | C | T | tRNA-Leu |
| <i>folP</i> | G | C | dihydropteroate synthase |
| <i>SO_1260</i> | C | T | ABC transporter substrate-binding protein |
| <i>SO_1274</i> | G | A | FAD-binding oxidoreductase |
| <i>SO_1280</i> | C | A | IS256-like element ISSod4 family transposase |
| <i>plsY</i> | C | T | glycerol-3-phosphate 1-O-acyltransferase PlsY |

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|----------------|---|---|---|
| <i>thyA</i> | A | G | thymidylate synthase |
| <i>thyA</i> | C | T | thymidylate synthase |
| <i>SO_1367</i> | G | A | chorismate mutase |
| <i>SO_1371</i> | C | T | RDD family protein |
| <i>SO_1547</i> | T | C | transposase |
| <i>SO_1557</i> | A | G | porin |
| <i>frr</i> | G | A | ribosome recycling factor |
| <i>SO_1657</i> | G | T | YdcF family protein |
| <i>SO_1681</i> | G | A | enoyl-CoA hydratase/isomerase family protein |
| <i>SO_1695</i> | A | G | diguanylate cyclase |
| <i>SO_1707</i> | C | T | ABC transporter permease |
| <i>SO_1758</i> | A | G | YafY family protein |
| <i>SO_t025</i> | C | T | tRNA-Arg |
| <i>SO_t026</i> | C | G | tRNA-His |
| <i>ffs</i> | A | G | signal recognition particle sRNA small type |
| <i>SO_1840</i> | T | A | DUF2157 domain-containing protein |
| <i>SO_t034</i> | G | A | tRNA-Cys |
| <i>SO_1909</i> | A | G | class III extradiol ring-cleavage dioxygenase |
| <i>tesB</i> | C | T | acyl-CoA thioesterase II |
| <i>SO_1926</i> | G | A | citrate synthase |
| <i>SO_1929</i> | A | G | succinate dehydrogenase iron-sulfur subunit |
| <i>sucA</i> | A | G | 2-oxoglutarate dehydrogenase E1 component |
| <i>sucD</i> | A | G | succinate--CoA ligase subunit alpha |
| <i>SO_1936</i> | T | C | GNAT family N-acetyltransferase |
| <i>SO_2009</i> | A | G | DUF2063 domain-containing protein |
| <i>SO_2033</i> | C | T | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2033</i> | A | G | AAA family ATPase |
| <i>SO_2039</i> | A | C | EAL domain-containing protein |
| <i>SO_2050</i> | C | T | class I SAM-dependent methyltransferase |
| <i>SO_2100</i> | C | G | TlpA disulfide reductase family protein |
| <i>SO_2103</i> | T | C | FAD:protein FMN transferase |
| <i>adhE</i> | A | G | bifunctional acetaldehyde-CoA/alcohol dehydrogenase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>SO_2179</i> | A | G | 6-carboxytetrahydropterin synthase |
| <i>nagZ</i> | G | A | beta-N-acetylhexosaminidase |
| <i>ccoN</i> | T | C | cytochrome-c oxidase, cbb3-type subunit I |
| <i>emrD</i> | A | G | multidrug efflux MFS transporter EmrD |
| <i>SO_2392</i> | A | G | IS256-like element ISSod4 family transposase |

| | | | |
|-----------------|---|---|--|
| <i>SO_2395</i> | C | T | acyl-CoA dehydrogenase family protein |
| <i>cmk</i> | G | A | (d)CMP kinase |
| <i>cmoB</i> | G | C | tRNA 5-methoxyuridine(34)/uridine 5-oxyacetic acid(34) synthase CmoB |
| <i>SO_2455</i> | G | A | LysR family transcriptional regulator |
| <i>SO_2463</i> | G | T | IS3-like element ISSod1 family transposase |
| <i>gene2276</i> | G | A | acyl-CoA dehydrogenase |
| <i>SO_2549</i> | G | A | BON domain-containing protein |
| <i>SO_2565</i> | T | C | BsuPI-related putative proteinase inhibitor |
| <i>aat</i> | T | C | leucyl/phenylalanyl-tRNA--protein transferase |
| <i>SO_2699</i> | T | C | phage baseplate assembly protein |
| <i>SO_2714</i> | C | T | hypothetical protein |
| <i>tolQ</i> | C | A | protein TolQ |
| <i>ybgC</i> | T | C | tol-pal system-associated acyl-CoA thioesterase |
| <i>rnt</i> | T | C | ribonuclease T |
| <i>upp</i> | G | A | uracil phosphoribosyltransferase |
| <i>purN</i> | T | C | phosphoribosylglycinamide formyltransferase |
| <i>SO_2850</i> | G | A | GNAT family N-acetyltransferase |
| <i>SO_2890</i> | T | C | STAS/SEC14 domain-containing protein |
| <i>SO_2890</i> | A | C | STAS/SEC14 domain-containing protein |
| <i>zipA</i> | C | T | cell division protein ZipA |
| <i>SO_2905</i> | T | A | methyltransferase |
| <i>SO_2905</i> | G | A | methyltransferase |
| <i>SO_2907</i> | T | G | TonB-dependent siderophore receptor |
| <i>SO_3069</i> | G | C | FimV/HubP family polar landmark protein |
| <i>SO_3069</i> | G | T | FimV/HubP family polar landmark protein |
| <i>SO_3085</i> | G | A | hypothetical protein |
| <i>SO_3119</i> | A | C | hypothetical protein |
| <i>SO_3121</i> | G | A | CIA30 family protein |
| <i>SO_3125</i> | T | C | DEAD/DEAH box helicase |
| <i>SO_3161</i> | T | A | hypothetical protein |
| <i>SO_3162</i> | T | C | sensor histidine kinase |
| <i>SO_3162</i> | T | A | sensor histidine kinase |
| <i>SO_3163</i> | G | T | copper resistance protein NlpE |
| <i>SO_3168</i> | T | C | molecular chaperone DnaJ |
| <i>rfbA</i> | G | A | glucose-1-phosphate thymidyltransferase RfbA |
| <i>fliD</i> | G | A | flagellar filament capping protein FliD |
| <i>SO_3238</i> | G | A | flagellin |

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|----------------|---|---|--|
| <i>flgJ</i> | T | A | flagellar assembly peptidoglycan hydrolase FlgJ |
| <i>pseC</i> | G | C | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>pseC</i> | G | A | UDP-4-amino-4,6-dideoxy-N-acetyl-beta-L- altrosamine transaminase |
| <i>phrB</i> | G | A | deoxyribodipyrimidine photo-lyase |
| <i>SO_3420</i> | T | C | cytochrome c |
| <i>SO_t090</i> | T | C | tRNA-Ser |
| <i>lldR</i> | T | C | LysR family transcriptional regulator LldR |
| <i>SO_3461</i> | T | C | AEC family transporter |
| <i>SO_3492</i> | T | C | efflux RND transporter permease subunit |
| <i>SO_3493</i> | T | A | efflux RND transporter periplasmic adaptor subunit |
| <i>SO_3512</i> | C | T | SapC family protein |
| <i>SO_3521</i> | T | C | GspH/FimT family pseudopilin |
| <i>SO_3525</i> | T | C | pilus assembly protein |
| <i>gshA</i> | C | T | glutamate--cysteine ligase |
| <i>SO_3580</i> | C | T | outer membrane protein assembly factor BamD |
| <i>SO_3604</i> | C | G | IS256-like element ISSod4 family transposase |
| <i>SO_3609</i> | G | A | IS3-like element ISSod1 family transposase |
| <i>SO_3623</i> | C | T | cytochrome c3 family protein |
| <i>SO_3625</i> | G | A | IS4-like element ISSod3 family transposase |
| <i>SO_3781</i> | G | A | type II secretion system protein |
| <i>SO_3796</i> | A | G | PH domain-containing protein |
| <i>SO_3796</i> | G | A | PH domain-containing protein |
| <i>SO_3812</i> | T | C | peptidylprolyl isomerase |
| <i>SO_3918</i> | G | A | S46 family peptidase |
| <i>rplI</i> | T | C | 50S ribosomal protein L9 |
| <i>rpsF</i> | G | T | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | C | 30S ribosomal protein S6 |
| <i>rpsF</i> | G | A | 30S ribosomal protein S6 |
| <i>rpsF</i> | T | A | 30S ribosomal protein S6 |
| <i>rpsI</i> | G | A | 30S ribosomal protein S9 |
| <i>murA</i> | G | T | UDP-N-acetylglucosamine 1- carboxyvinyltransferase |
| <i>murA</i> | G | C | UDP-N-acetylglucosamine 1- carboxyvinyltransferase |
| <i>kdsC</i> | T | C | 3-deoxy-manno-octulosonate-8-phosphatase KdsC |
| <i>lptB</i> | G | A | LPS export ABC transporter ATP-binding |

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|-----------------|---|---|---|
| | | | protein |
| <i>SO_3969</i> | A | G | OmpA family protein |
| <i>gene3723</i> | G | A | insulinase family protein |
| <i>SO_3987</i> | G | C | DUF3293 domain-containing protein |
| <i>SO_4022</i> | C | T | pitrilysin family protein |
| <i>SO_4051</i> | C | A | HlyD family secretion protein |
| <i>SO_4051</i> | A | T | HlyD family secretion protein |
| <i>SO_4102</i> | A | G | PilW family protein |
| <i>mshL</i> | A | G | pilus (MSHA type) biogenesis protein MshL |
| <i>SO_4131</i> | G | A | outer membrane protein OmpK |
| <i>hslV</i> | A | T | ATP-dependent protease subunit HslV |
| <i>SO_4258</i> | G | C | integrase arm-type DNA-binding domain-containing protein |
| <i>SO_4262</i> | G | A | hypothetical protein |
| <i>pstB</i> | A | G | phosphate ABC transporter ATP-binding protein PstB |
| <i>pstB</i> | G | T | phosphate ABC transporter ATP-binding protein PstB |
| <i>SO_4319</i> | T | C | HlyD family type I secretion periplasmic adaptor subunit |
| <i>SO_4366</i> | G | T | beta-ketoacyl synthase chain length factor |
| <i>SO_4368</i> | G | A | phosphopantetheine-binding protein |
| <i>SO_4421</i> | G | A | DUF2986 domain-containing protein |
| <i>SO_4426</i> | A | G | TIGR01621 family pseudouridine synthase |
| <i>SO_4525</i> | A | G | patatin family protein |
| <i>menD</i> | G | A | 2-succinyl-5-enolpyruvyl-6-hydroxy-3-cyclohexene-1-carboxylic-acid synthase |
| <i>menH</i> | T | C | 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate synthase |
| <i>SO_4635</i> | G | A | methyl-accepting chemotaxis protein |
| <i>SO_4655</i> | T | C | sulfate/molybdate ABC transporter ATP-binding protein |
| <i>yihA</i> | G | C | ribosome biogenesis GTP-binding protein YihA/YsxC |
| <i>SO_4686</i> | A | T | NAD-dependent epimerase |
| <i>SO_4694</i> | A | T | TorF family putative porin |
| <i>SO_4701</i> | T | C | hypothetical protein |
| <i>SO_4701</i> | A | C | hypothetical protein |
| <i>mobA</i> | A | G | molybdenum cofactor guanylyltransferase MobA |
| <i>mmnG</i> | A | G | tRNA uridine-5-carboxymethylaminomethyl(34) synthesis enzyme MnmG |

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|-----------------|---|---|--|-----|
| <i>gene4455</i> | C | T | peptidase domain-containing transporter | ABC |
| <i>gene4523</i> | C | T | tandem-95 repeat protein | |
| <i>gene4526</i> | A | G | IS3 family transposase | |
