### Table S1: Extracellular Fluxes into Cell

| Component     | Early Exponential Low Gln | Early Exponential Gln Suppl | Late Exponential Low Gln | Late Exponential Gln Suppl |
|---------------|---------------------------|----------------------------|--------------------------|---------------------------|
| Antibody     | -65                       | -61                        | -51                      | -44                       |
| Biomass      | -620                      | -590                       | -200                     | -200                      |
| Glucose      | 100                       | 110                        | 31                       | 31                        |
| Lactate      | -58                       | -73                        | 4.8                      | 6.7                       |
| Alanine      | -8.4                      | -17                        | -1.7                     | -3                        |
| Asparagine   | 14                        | 14                         | 4.2                      | 3.9                       |
| Aspartate    | 1.2                       | -4                         | 9.6                      | 8.5                       |
| Glutamine    | 2.1                       | 19                         | 0.3                      | 2.1                       |
| Glutamate    | -1.4                      | -3.3                       | 2                        | 1.3                       |

All fluxes are relative to control group glucose (defined as 100). Negative indicates production, positive indicates consumption. All fluxes are given in unit/cell-day.
## Early Exponential Low Gln Media MFA Results

| Reaction Name | Chemical Reaction | Flux  | Standard Err | 95% Low  | 95% High |
|---------------|-------------------|-------|--------------|----------|----------|
| Glucose In    | G6P_EX -> G6P     | 100.0 | 0.0          | 100.0    | 100.0    |
| R2            | G6P -> F6P        | 81.8  | 6.1          | 79.9     | 96.1     |
| R3 net        | F6P <-> G3P + G3P | 89.1  | 2.1          | 87.6     | 94.1     |
| R3 exch       | F6P <-> G3P + G3P | 0.0   | 18907.8      | 0.0      | Inf      |
| R4            | G3P -> PEP        | 174.2 | 528.8        | 170.5    | 183.4    |
| PEP to Pyr    | PEP -> PYR        | 174.2 | 528.7        | 170.5    | 183.8    |
| Pyr to Lac net| PYR <-> LAC       | 57.7  | 2.9          | 52.1     | 63.3     |
| Pyr to Lac exch| PYR <-> LAC     | 0.0   | 82157.3      | 0.0      | 244.1    |
| R7            | G6P -> P5P + CO2  | 14.2  | 6.1          | 0.0      | 18.0     |
| R8 net        | P5P + P5P <-> S7P + G3P | 3.6 | 2.0 | -1.1 | 4.9 |
| R8 exch       | P5P + P5P <-> S7P + G3P | 0.0 | 13.6 | 0.0 | Inf |
| R9 net        | S7P + G3P <-> F6P + E4P | 3.6 | 2.0 | -1.1 | 4.9 |
| R9 exch       | S7P + G3P <-> F6P + E4P | 0.0 | 18907.8 | 0.0 | Inf |
| R10 net       | P5P + E4P <-> F6P + G3P | 3.6 | 2.0 | -1.1 | 4.9 |
| R10 exch      | P5P + E4P <-> F6P + G3P | 0.0 | 7.3 | NaN | NaN |
| R11           | PYR -> ACCOA + CO2 | 108.0 | 508.8 | 99.6 | 120.9 |
| R12 net       | ACCOA + OAA <-> ICI | 110.2 | 246.9 | 93.6 | 128.0 |
| R12 exch      | ACCOA + OAA <-> ICI | 2086875.9 | 18907.8 | 893.5 | Inf |
| R13 net       | ICI <-> AKG + CO2 | 110.2 | 246.9 | 93.6 | 128.0 |
| R13 exch      | ICI <-> AKG + CO2 | 19.1  | 44.4        | 10.3     | 31.0     |
| R17 net       | FUM <-> MAL       | 109.3 | 227.0        | 91.3     | 128.7    |
| R17 exch      | FUM <-> MAL       | 10086011.6 | 18907.8 | 8628.2 | Inf |
| R18 net       | MAL <-> OAA       | 85.4  | 18908.8      | 68.9     | 103.0    |
| R18 exch      | MAL <-> OAA       | 9729464.5 | 18907.8 | 8628.2 | Inf |
| R19           | OAA -> PEP + CO2  | 0.0   | 15.8         | 0.0      | 3.3      |
| R20 net       | MAL <-> PYR + CO2 | 24.0  | 18906.8      | 20.0     | 29.8     |
| R20 exch      | MAL <-> PYR + CO2 | 0.0   | 18907.8      | 0.0      | 4.9      |
| R21           | PYR + CO2 -> OAA  | 17.0  | 18907.8      | 0.0      | 21.8     |
| Ala Out net   | ALA <-> ALA.EX    | 8.4   | 0.8          | 6.7      | 10.0     |
| Ala Out exch  | ALA <-> ALA.EX    | 12.5  | 27760.4      | 9.5      | 47.0     |
| Arg In        | ARG_EX -> ARG     | 7.7   | 18907.8      | 7.3      | 10.9     |
| Asn In net    | ASN.EX <-> ASN    | 14.2  | 0.7          | 12.9     | 15.6     |
| Asn In exch   | ASN.EX <-> ASN    | 13.9  | 19084.5      | 0.0      | Inf      |
| Asp In net    | ASP.EX <-> ASP    | 1.2   | 0.1          | 0.9      | 1.4      |
| Asp In exch   | ASP.EX <-> ASP    | 57.7  | 149.1        | 42.8     | 72.7     |
| Cys In net    | CYS.EX <-> CYS    | 2.3   | 0.3          | 2.1      | 2.5      |
| Cys In exch   | CYS.EX <-> CYS    | 3.3   | 18907.8      | 0.0      | Inf      |
| Gln Out net   | GLN <-> GLN.EX    | -2.1  | 0.2          | -2.5     | -1.7     |
| Gln Out exch  | GLN <-> GLN.EX    | 3.5   | 11.3         | 2.6      | 12.7     |
| Glu In net    | GLU.EX <-> GLU    | -1.4  | 0.1          | -1.7     | -1.1     |
| Glu In exch   | GLU.EX <-> GLU    | 5.0   | 0.0          | 5.0      | 5.0      |
| Gly Out net   | GLY <-> GLY.EX    | 0.5   | 0.1          | 0.3      | 0.7      |
| Gly Out exch  | GLY <-> GLY.EX    | 31.1  | 3052.9       | 0.0      | 84.2     |
| His in        | HIS_EX -> HIS     | 1.9   | 0.1          | 1.7      | 2.0      |
| Ile In        | ILE_EX -> ILE     | 4.3   | 0.2          | 4.0      | 4.5      |
| Leu In        | LEU_EX -> LEU     | 10.1  | 18907.8      | 9.4      | 24.2     |
| Lys In        | LYS_EX -> LYS     | 26.1  | 28361.2      | 7.3      | 28.9     |
| Met In        | MET_EX -> MET     | 3.7   | 0.2          | 3.4      | 3.9      |
| Phe In        | PHE_EX -> PHE     | 7.9   | 18907.8      | 3.5      | 9.4      |
| Pro In        | PRO_EX -> PRO     | 18.1  | 18907.8      | 17.3     | 21.4     |
| Ser In net    | SER.EX <-> SER    | 11.8  | 1.2          | 9.4      | 14.1     |
| Ser In exch   | SER.EX <-> SER    | 17.0  | 2564.9       | 0.0      | 40.8     |
| Thr In        | THR_EX -> THR     | 5.5   | 528.9        | 5.1      | 12.2     |
| Reaction Name | Chemical Reaction | Flux  | Standard Err | 95% Low | 95% High |
|---------------|------------------|------|--------------|---------|----------|
| Tyr In        | TYR_EX -> TYR   | 0.0  | 18907.8      | 0.0     | 5.6      |
| Val In        | VAL_EX -> VAL   | 6.3  | 0.5          | 5.9     | 6.7      |
| R43 net       | PYR <-> ALA     | 15.5 | 0.9          | 13.8    | 17.2     |
| R43 exch      | PYR <-> ALA     | 0.0  | 34461.2      | NaN     | NaN      |
| R44 net       | AKG <-> GLU     | 0.9  | 26.1         | -2.3    | 3.6      |
| R44 exch      | AKG <-> GLU     | 124.9| 270.9        | 97.1    | 166.9    |
| R45 net       | GLU <-> GLN     | 2.4  | 0.3          | 1.9     | 2.8      |
| R45 exch      | GLU <-> GLN     | 626.5| 18907.8      | 4.8     | Inf      |
| R46           | ARG -> GLU + CO2| 2.0  | 18907.8      | 0.0     | 5.1      |
| R47 net       | OAA <-> ASP     | -7.9 | 0.8          | -9.3    | -6.5     |
| R47 exch      | OAA <-> ASP     | 346.9| 889.8        | 249.6   | 554.0    |
| R48 net       | ASP -> ASN      | -11.5| 0.7          | -12.9   | -10.2    |
| R48 exch      | ASP -> ASN      | 16.5 | 18907.8      | NaN     | NaN      |
| R49 net       | G3P <-> SER     | 5.9  | 528.9        | 0.6     | 8.5      |
| R49 exch      | G3P <-> SER     | 0.0  | 9.7          | 0.0     | 1.8      |
| R50 net       | SER <-> GLY + CO2| 9.5 | 528.9      | 3.0     | 10.1     |
| R50 exch      | SER <-> GLY + CO2| 30.2 | 2689.0    | 3.0     | 72.6     |
| R51           | SER -> CYS      | 0.0  | 0.3          | 0.0     | 0.2      |
| R52           | PHE -> TYR      | 4.2  | 18907.8      | 0.0     | 5.6      |
| R53           | PRO -> GLU      | 6.1  | 18907.8      | 0.0     | 9.3      |
| R54           | PROC OA + CO2 -> 0.5*SUC + 0.5*SUC | 0.0 | 0.6 | 0.0 | 0.4 |
| R55           | VAL -> VAL1 + CO2| 0.0 | 0.6 | 0.0 | 0.4 |
| R56           | VAL1 -> PROC OA + CO2| 0.0 | 0.6 | 0.0 | 0.4 |
| R57           | ACAC -> ACC OA + ACC OA | 18.3 | 9459.1 | 11.8 | 21.1 |
| R58           | LEU -> LEU1 + CO2| 0.1 | 18907.8 | 0.0 | 3.6 |
| R59           | LEU1 + CO2 -> ACC OA + ACAC | 0.1 | 18907.8 | 0.0 | 3.6 |
| R60           | THR -> GLY + ACC OA | 0.0 | 528.9 | 0.0 | 6.6 |
| R61           | KETOADI -> ACAC + CO2 | 18.3 | 28361.2 | 0.0 | 21.1 |
| R62           | LYS -> KETOADI + CO2 | 18.3 | 28361.2 | 0.0 | 21.1 |
| R63           | TYR -> 0.5*SUC + 0.5*SUC + 0.5*SUC | 0.0 | 46.3 | NaN | 1.4 |
| R64           | TYR1 -> ACAC + CO2 | 0.0 | 46.3 | NaN | NaN |
| Lact Out net  | LAC <-> LAC.EX  | 57.7 | 2.9 | 52.1 | 63.3 |
| Lact Out exch | LAC <-> LAC.EX  | 13.3 | 18907.8 | 5.9 | 31.6 |
| Symmetric B1 net | AKG <-> SUC + CO2 | 109.3 | 273.0 | 91.3 | 128.7 |
| Symmetric B1 exch | AKG <-> SUC + CO2 | 8.2 | 18.7 | 0.0 | 18.8 |
| Symmetric B2 net | SUC <-> FUM | 109.3 | 227.0 | 91.3 | 128.7 |
| Symmetric B2 exch | SUC <-> FUM | 2420400.4 | 18907.8 | 0.0 | Inf |
| PYR In net    | 0*PYR.EX <-> 0*PYR | 0.0 | 18907.8 | NaN | NaN |
| PYR In exch   | 0*PYR.EX <-> 0*PYR | 0.0 | 18907.8 | NaN | NaN |
| GLX 2         | 0*GLU -> 0*GLX  | 0.2  | 18907.8      | NaN     | NaN     |
| ASX 1         | 0*ASN -> 0*ASX  | 0.0  | 18907.8      | 0.0     | Inf     |
| ASX 2         | 0*ASP -> 0*ASX  | 1.7  | 18907.8      | NaN     | NaN     |
| Ser Dilution  | 0*SER -> SER.ms| 100.5| 18907.8 | 0.0 | 100.6 |
| Ser Dilution 2 | SER.ul -> SER.ms | 0.4 | 18907.8 | 0.0 | 101.0 |
| Ser Dilution 3 | SER.ms -> sink | 101.0| 0.0 | 101.0 | 101.0 |
| Pyr Dilution 1 | 0*PYR -> PYR.ms | 24.0 | 12830.0 | 0.0 | Inf |
| Pyr Dilution 2 | PYR.ul -> PYR.ms | 11.4 | 6078.2 | NaN | NaN |
| Pyr Dilution 3 | PYR.ms -> PYR.sink | 35.3 | 18907.8 | 31.6 | Inf |
| Mal Dilution 2 | MAL ul -> MAL.ms | 0.1 | 18907.8 | NaN | NaN |
| Mal Dilution 3 | MAL.ms -> MAL.sink | 0.1 | 18907.8 | NaN | NaN |
| Reaction Name | Chemical Reaction | Flux | Standard Err | 95% Low | 95% High |
|---------------|-------------------|------|--------------|---------|----------|
| CIT Dil 2     | ICl.ul -> ICl.ms  | 0.2  | 18907.8      | NaN     | Inf      |
| CIT Dil 3     | ICl.ms -> ICl.sink| 0.2  | 18907.8      | NaN     | NaN      |

"Net" reactions indicate the net flux in the forward direction for reversible reactions. "Exchange" reactions represent the forward flux for the reaction as written. Dilution reactions help account for unlabeled sources of certain measured metabolites.
### Early Exponential Gln-Supp. Media MFA Results

| Reaction Name | Chemical Reaction | Flux   | Standard Err | 95% Low | 95% High |
|---------------|-------------------|--------|--------------|---------|----------|
| Glucose In    | G6P_EX -> G6P     | 111.6  | 0.0          | 111.6   | 111.6    |
| R2            | G6P -> F6P        | 97.0   | 7.8          | 91.5    | 108.1    |
| R3 net        | F6P <-> G3P + G3P | 102.1  | 2.6          | 100.2   | 106.2    |
| R3 exch       | F6P <-> G3P + G3P | 175900.6 | 20992.0     | NaN     | Inf      |
| R4            | G3P -> PEP        | 202.7  | 49.1         | 197.0   | 210.0    |
| PEP to Pyr    | PEP -> PYR        | 202.7  | 51.2         | 197.0   | 210.0    |
| Pyr to Lac net| PYR <-> LAC       | 72.7   | 3.8          | 66.1    | 79.2     |
| Pyr to Lac exch| PYR <-> LAC     | 6.4    | 20992.0      | NaN     | Inf      |
| R7            | G6P -> P5P + CO2  | 10.8   | 7.8          | 0.0     | 16.2     |
| R8 net        | P5P + P5P <-> S7P + G3P | 2.6 | 2.6 | -1.1 | 4.4 |
| R8 exch       | P5P + P5P <-> S7P + G3P | 0.0 | 28.3 | NaN | 19.1 |
| R9 net        | S7P + G3P <-> F6P + E4P | 2.6 | 2.6 | -1.1 | 4.4 |
| R9 exch       | S7P + G3P <-> F6P + E4P | 1.0 | 20992.0 | NaN | Inf |
| R10 net       | P5P + E4P <-> F6P + G3P | 2.6 | 2.6 | -1.1 | 4.4 |
| R10 exch      | P5P + E4P <-> F6P + G3P | 0.5 | 4.7 | 0.0 | 14.4 |
| R11           | PYR -> ACCOA + CO2 | 121.6  | 48.9         | 111.9   | 133.9    |
| R12 net       | ACCOA + OAA <-> ICI | 105.1  | 54.7         | 94.0    | 119.4    |
| R12 exch      | ACCOA + OAA <-> ICI | 948530.4 | 20992.0    | NaN     | Inf      |
| R13 net       | ICI <-> AKG + CO2 | 105.1  | 54.7         | 94.0    | 119.4    |
| R13 exch      | ICI <-> AKG + CO2 | 8.9    | 4.3          | 5.4     | 13.5     |
| R17 net       | FUM <-> MAL       | 118.1  | 55.4         | 104.3   | 135.3    |
| R17 exch      | FUM <-> MAL       | 4013805.5 | 20992.0  | 1912.2  | Inf      |
| R18 net       | MAL <-> OAA       | 102.4  | 20992.0      | 86.7    | 114.2    |
| R18 exch      | MAL <-> OAA       | 6277086.9 | 20992.0  | 4878.7  | Inf      |
| R19           | OAA -> PEP + CO2  | 0.0    | 9.1          | 0.0     | 2.4      |
| R20 net       | MAL <-> PYR + CO2 | 15.7   | 20992.0      | 11.1    | 41.1     |
| R20 exch      | MAL <-> PYR + CO2 | 18.8   | 20992.0      | 18.1    | 24.9     |
| R21           | PYR + CO2 -> OAA  | 0.0    | 20992.0      | NaN     | 10.6     |
| Ala Out net   | ALA <-> ALA.EX    | 17.4   | 1.8          | 13.9    | 20.8     |
| Ala Out exch  | ALA <-> ALA.EX    | 73.2   | 20.2         | 59.7    | 80.7     |
| Arg In        | ARG_EX -> ARG     | 12.2   | 20992.0      | 11.3    | 16.3     |
| Asn In net    | ASN.EX <-> ASN    | 13.8   | 0.7          | 12.4    | 15.1     |
| Asn In exch   | ASN.EX <-> ASN    | 20.1   | 16379.4      | NaN     | 45.9     |
| Asp In net    | ASP.EX <-> ASP    | -4.0   | 0.4          | -4.7    | -3.2     |
| Asp In exch   | ASP.EX <-> ASP    | 134.8  | 90.9         | 110.2   | 165.9    |
| Cys In net    | CYX.EX <-> CYX    | 2.2    | 0.3          | 1.9     | 2.3      |
| Cys In exch   | CYX.EX <-> CYX    | 0.4    | 20992.0      | 0.0     | Inf      |
| Gln Out net   | GLN <-> GLN.EX    | -18.6  | 1.0          | -20.1   | -17.3    |
| Gln Out exch  | GLN <-> GLN.EX    | 0.0    | 0.0          | 0.0     | 0.0      |
| Glu In net    | GLU.EX <-> GLU    | -3.3   | 0.3          | -4.0    | -2.7     |
| Glu In exch   | GLU.EX <-> GLU    | 5.0    | 0.0          | 5.0     | 5.0      |
| Gly Out net   | GLY <-> GLY.EX    | 0.0    | 0.1          | -0.2    | 0.2      |
| Gly Out exch  | GLY <-> GLY.EX    | 8.1    | 235.7        | 0.0     | 40.4     |
| His In        | HIS.EX -> HIS     | 1.7    | 0.1          | 1.6     | 1.9      |
| Ile In        | ILE_EX -> ILE     | 4.0    | 0.2          | 3.7     | 4.3      |
| Leu In        | LEU_EX -> LEU     | 9.5    | 20992.0      | 8.9     | 16.2     |
| Lys In        | LYS.EX -> LYS     | 13.5   | 31488.4      | 6.8     | 17.3     |
| Met In        | MET_EX -> MET     | 3.5    | 0.2          | 3.2     | 3.7      |
| Phe In        | PHE_EX -> PHE     | 7.3    | 20992.0      | 3.3     | 8.9      |
| Pro In        | PRO_EX -> PRO     | 11.3   | 20992.0      | 10.5    | 19.5     |
| Ser In net    | SER.EX <-> SER    | 10.1   | 1.0          | 8.2     | 12.1     |
| Ser In exch   | SER.EX <-> SER    | 0.0    | 195.8        | NaN     | 22.4     |
| Thr In        | THR_EX -> THR     | 8.6    | 49.1         | 4.9     | 12.5     |
| Reaction Name | Chemical Reaction | Flux | Standard Err | 95% Low | 95% High |
|---------------|-------------------|------|--------------|---------|----------|
| Tyr In        | TYR_EX -> TYR     | 0.2  | 20992.0      | NaN     | 5.5      |
| Val In        | VAL_EX -> VAL     | 5.9  | 0.5          | 5.5     | 6.3      |
| R43 net       | PYR <-> ALA       | 24.1 | 1.8          | 20.6    | 27.5     |
| R43 exch      | PYR <-> ALA       | 153.0| 53.3         | 0.0     | 179.5    |
| R44 net       | AKG <-> GLU       | -13.0| 6.6          | -17.6   | -8.6     |
| R44 exch      | AKG <-> GLU       | 363.4| 188.3        | 274.8   | 518.0    |
| R45 net       | GLU <-> GLN       | -14.4| 1.0          | -16.0   | -13.1    |
| R45 exch      | GLU <-> GLN       | 0.0  | 33.8         | 0.0     | 8.6      |
| R46           | ARG -> GLU + CO2  | 6.8  | 20992.0      | 0.0     | 10.8     |
| R47 net       | OAA <-> ASP       | -2.8 | 0.9          | -4.4    | -1.1     |
| R47 exch      | OAA <-> ASP       | 70.2 | 44.8         | 59.2    | 82.6     |
| R48 net       | ASP <-> ASN       | -11.3| 0.7          | -12.6   | -9.9     |
| R48 exch      | ASP <-> ASN       | 26.2 | 20992.0      | 5.7     | 64.0     |
| R49 net       | G3P <-> SER       | 2.6  | 48.9         | -0.4    | 7.4      |
| R49 exch      | G3P <-> SER       | 0.0  | 6.9          | 0.0     | 3.0      |
| R50 net       | SER <-> GLY + CO2 | 5.0  | 49.0         | 1.3     | 8.9      |
| R50 exch      | SER <-> GLY + CO2 | 10.2 | 196.6        | 3.8     | 42.7     |
| R51           | SER -> CYS        | 0.0  | 0.3          | 0.0     | 0.3      |
| R52           | PHE -> TYR        | 3.7  | 20992.0      | 0.0     | 5.3      |
| R53           | PRO -> GLU        | 0.0  | 20992.0      | 0.0     | 8.5      |
| R54           | PROCOA + CO2 -> 0.5*SUC + 0.5*SUC | 0.0 | 0.5 | 0.0 | 0.3 |
| R55           | VAL -> VAL1 + CO2 | 0.0  | 0.5          | 0.0     | 0.3      |
| R56           | VAL1 -> PROCOA + CO2 | 0.0 | 0.5 | 0.0 | 0.3 |
| R57           | ACAC -> ACCOA + ACCOA | 6.2 | 10496.5 | 2.1 | 10.1 |
| R58           | LEU -> LEU1 + CO2 | 0.1  | 20992.0      | NaN     | 6.7      |
| R59           | LEU1 + CO2 -> ACCOA + ACAC | 0.1 | 20992.0 | NaN | 6.7 |
| R60           | THR -> GLY + ACCOA | 3.5 | 49.0 | 0.0 | 7.2 |
| R61           | KETOADI -> ACAC + CO2 | 6.1 | 31488.4 | 0.0 | 10.0 |
| R62           | LYS -> KETOADI + CO2 | 6.1 | 31488.4 | 0.0 | 10.0 |
| R63           | TYR -> 0.5*SUC + 0.5*SUC + TYR1 | 0.0 | 7.5 | NaN | 1.5 |
| R64           | TYR1 -> ACAC + CO2 | 0.0 | 7.5 | NaN | 1.5 |
| Lact Out net  | LAC <-> LAC.EX    | 72.7 | 3.8         | 66.1    | 79.2     |
| Lact Out exch | LAC <-> LAC.EX    | 0.0  | 1.5         | 0.0     | 26.0     |
| Symmetric B1 net | AKG <-> SUC + CO2 | 118.1 | 60.7 | 104.3 | 132.7 |
| Symmetric B1 exch | AKG <-> SUC + CO2 | 13.3 | 9.4 | 0.6 | 27.5 |
| Symmetric B2 net | SUC <-> FUM      | 118.1| 55.4        | 104.3   | 135.3    |
| Symmetric B2 exch | SUC <-> FUM    | 2815217.5 | 20992.0 | 174.3 | Inf     |
| PYR In net    | 0*PYR.EX <-> 0*PYR | 0.0  | 29688.0      | NaN     | NaN      |
| PYR In exch   | 0*PYR.EX <-> 0*PYR | 0.0  | 20992.0      | 0.0     | Inf      |
| GLX 2         | 0*GLU -> 0*GLX   | 4.7  | 20992.0      | NaN     | Inf      |
| ASX 1         | 0*ASN -> 0*ASX   | 766.5| 20992.0      | 0.0     | Inf      |
| ASX 2         | 0*ASP -> 0*ASX   | 0.2  | 20992.0      | NaN     | Inf      |
| Ser Dilution 2 | 0*SER -> SER.ms  | 97.9 | 20992.0      | 0.0     | 98.0     |
| Ser Dilution 3 | SER.ms -> sink  | 101.0| 0.0         | 101.0   | 101.0    |
| Pyr Dilution 1 | 0*PYR -> PYR.ms  | 100.8| 20992.0      | NaN     | 100.9    |
| Pyr Dilution 2 | PYR.ul -> PYR.ms | 0.1  | 20992.0      | 0.0     | 50.3     |
| Pyr Dilution 3 | PYR.ms -> PYR.sink | 101.0 | 0.0 | 101.0 | 101.0 |
| Mal Dilution 2 | MALul -> MAL.ms | 0.0  | 20992.0      | 0.0     | Inf      |
| Mal Dilution 3 | MAL.ms -> MAL.sink | 0.0 | 20992.0 | 0.0 | Inf      |
"Net" reactions indicate the net flux in the forward direction for reversible reactions. "Exchange" reactions represent the forward flux for the reaction as written. Dilution reactions help account for unlabeled sources of certain measured metabolites.

| Reaction Name | Chemical Reaction | Flux | Standard Err | 95% Low | 95% High |
|---------------|-------------------|------|--------------|---------|----------|
| CIT Dil 2     | ICl.ul -> ICl.ms  | 0.0  | 20992.0      | NaN     | Inf      |
| CIT Dil 3     | ICl.ms -> ICl.sink| 0.0  | 20992.0      | NaN     | Inf      |
| Reaction Name | Chemical Reaction | Flux  | Standard Err | 95% Low | 95% High |
|--------------|------------------|------|--------------|---------|---------|
| Glucose In   | G6P_EX -> G6P    | 30.3 | 0.0          | 30.3    | 30.3    |
| R2           | G6P -> F6P       | 18.9 | 7.6          | 16.7    | 29.1    |
| R3 net       | F6P <-> G3P + G3P| 25.0 | 2.5          | 24.2    | 28.5    |
| R3 exch      | F6P <-> G3P + G3P| 7322.9 | 20764.8 | NaN    | Inf     |
| R4           | G3P -> PEP       | 53.0 | 2.7          | 51.3    | 57.7    |
| PEP to Pyr   | PEP -> PYR       | 53.0 | 20764.8     | 51.3    | 69.7    |
| Pyr to Lac net | PYR <-> LAC   | -4.8 | 0.3          | -5.2    | -4.3    |
| Pyr to Lac exch | PYR <-> LAC | 69.1 | 301636.2   | 27.3    | Inf     |
| R7           | G6P -> P5P + CO2 | 10.2 | 7.6          | 0.0     | 12.3    |
| R8 net       | P5P + P5P <-> S7P + G3P | 3.1 | 2.5      | -0.4    | 3.8     |
| R8 exch      | P5P + P5P <-> S7P + G3P | 0.0 | 222.2     | NaN    | Inf     |
| R9 net       | S7P + G3P <-> F6P + E4P | 3.1 | 2.5       | -0.4    | 3.8     |
| R9 exch      | S7P + G3P <-> F6P + E4P | 0.0 | 20764.8   | 0.0    | Inf     |
| R10 net      | P5P + E4P <-> F6P + G3P | 3.1 | 2.5       | -0.4    | 3.8     |
| R10 exch     | P5P + E4P <-> F6P + G3P | 0.0 | 13.1     | 0.0     | 8.5     |
| R11          | PYR -> ACCOA + CO2 | 63.7 | 7.5        | 61.0    | 69.3    |
| R12 net      | ACCOA + OAA <-> ICI | 54.4 | 7.8        | 50.1    | 61.6    |
| R12 exch     | ACCOA + OAA <-> ICI | 2023361.9 | 20764.8 | 445.2  | Inf     |
| R13 net      | ICI <-> AKG + CO2 | 54.4 | 7.8        | 50.1    | 61.6    |
| R13 exch     | ICI <-> AKG + CO2 | 120.9 | 51.9     | 56.3    | 215.6   |
| R17 net      | FUM <-> MAL      | 53.7 | 14.8       | 49.0    | 61.5    |
| R17 exch     | FUM <-> MAL      | 10089949.6 | 20764.8 | 1569.9  | Inf     |
| R18 net      | MAL <-> OAA      | 43.5 | 29365.9    | 38.8    | 57.8    |
| R18 exch     | MAL <-> OAA      | 10097623.8 | 20764.8  | 1252.6  | Inf     |
| R19          | OAA -> PEP + CO2 | 0.0  | 20764.8    | 0.0     | 6.2     |
| R20 net      | MAL <-> PYR + CO2 | 10.2 | 29365.9   | 6.3     | 13.7    |
| R20 exch     | MAL <-> PYR + CO2 | 0.0  | 20764.8   | 0.0     | 3.4     |
| R21          | PYR + CO2 -> OAA | 0.0  | 20764.8   | 0.0     | 3.4     |
| Ala Out net  | ALA <-> ALA.EX   | 1.7  | 0.2        | 1.4     | 2.1     |
| Ala Out exch | ALA <-> ALA.EX   | 0.5  | 21544.3    | NaN     | 11.5    |
| Arg In       | ARG_EX -> ARG    | 2.0  | 0.2        | 1.9     | 2.3     |
| Asn In net   | ASN.EX <-> ASN   | 4.1  | 0.4        | 3.3     | 4.9     |
| Asn In exch  | ASN.EX <-> ASN   | 577.9 | 2205825.9 | 13.3    | Inf     |
| Asp In net   | ASP.EX <-> ASP   | 9.6  | 0.5        | 8.7     | 10.5    |
| Asp In exch  | ASP.EX <-> ASP   | 978.5 | 1025.4    | 308.5   | Inf     |
| Cys In net   | CYS.EX <-> CYS   | 0.9  | 0.2        | 0.8     | 0.9     |
| Cys In exch  | CYS.EX <-> CYS   | 1.1  | 20764.8    | 0.0     | Inf     |
| Gln Out net  | GLN <-> GLN.EX   | -0.3 | 0.1        | -0.4    | -0.2    |
| Gln Out exch | GLN <-> GLN.EX   | 0.0  | 0.0        | 0.0     | 0.0     |
| Glu In net   | GLU.EX <-> GLU   | 2.0  | 0.2        | 1.6     | 2.4     |
| Glu In exch  | GLU.EX <-> GLU   | 3.1  | 0.2        | 2.7     | 3.5     |
| Gly Out net  | GLY <-> GLY.EX   | -0.4 | 0.1        | -0.6    | -0.2    |
| Gly Out exch | GLY <-> GLY.EX   | 33.3 | 741.2    | 0.0     | 308.6   |
| His In       | HIS.EX -> HIS    | 0.7  | 0.0        | 0.6     | 0.7     |
| Ile In       | ILE.EX -> ILE    | 1.5  | 0.1        | 1.4     | 1.6     |
| Leu In       | LEU.EX -> LEU    | 3.9  | 0.4        | 3.4     | 4.7     |
| Lys In       | LYS.EX -> LYS    | 2.8  | 0.3        | 2.7     | 3.2     |
| Met In       | MET.EX -> MET    | 1.2  | 0.0        | 1.1     | 1.3     |
| Phe In       | PHE.EX -> PHE    | 1.5  | 0.2        | 1.4     | 1.8     |
| Pro In       | PRO_EX -> PRO    | 4.2  | 7.5        | 3.9     | 6.2     |
| Ser In net   | SER.EX <-> SER   | 6.4  | 0.6        | 5.1     | 7.6     |
| Ser In exch  | SER.EX <-> SER   | 2.4  | 211.4      | 0.0     | 70.4    |
| Thr In       | THR.EX -> THR    | 2.7  | 0.3        | 2.1     | 3.2     |
| Reaction Name | Chemical Reaction | Flux  | Standard Err | 95% Low | 95% High |
|---------------|-------------------|-------|--------------|---------|----------|
| Tyr In        | TYR_EX -> TYR     | 1.5   | 0.2          | 1.3     | 1.7      |
| Val In        | VAL_EX -> VAL     | 3.2   | 0.3          | 2.6     | 3.8      |
| R43 net       | PYR <-> ALA       | 4.3   | 0.2          | 3.9     | 4.6      |
| R43 exch      | PYR <-> ALA       | 0.0   | 197741.8     | NaN     | Inf      |
| R44 net       | AKG <-> GLU       | 1.4   | 7.5          | -0.7    | 1.8      |
| R44 exch      | AKG <-> GLU       | 5036795.7 | 20764.8 | 82.9 | Inf      |
| R45 net       | GLU <-> GLN       | 1.4   | 0.1          | 1.2     | 1.5      |
| R45 exch      | GLU <-> GLN       | 4884523.6 | 20764.8 | 10.6 | Inf      |
| R46           | ARG -> GLU + CO2  | 0.0   | 0.2          | 0.0     | 0.3      |
| R47 net       | OAA <-> ASP       | -10.9 | 0.6          | -12.1   | -9.6     |
| R47 exch      | OAA <-> ASP       | 67.3  | 14.4         | 47.9    | 91.6     |
| R48 net       | ASP <-> ASN       | -3.1  | 0.4          | -3.9    | -2.2     |
| R48 exch      | ASP <-> ASN       | 54.8  | 20764.8      | NaN     | Inf      |
| R49 net       | G3P <-> SER       | -0.6  | 0.8          | -2.0    | 0.1      |
| R49 exch      | G3P <-> SER       | 2.5   | 63.2         | 0.5     | 12.5     |
| R50 net       | SER <-> GLY + CO2 | 2.4   | 0.3          | 1.7     | 3.0      |
| R50 exch      | SER <-> GLY + CO2 | 20.2  | 489.5        | 0.0     | 138.2    |
| R51           | SER -> CYS        | 0.0   | 0.2          | 0.0     | 0.1      |
| R52           | PHE -> TYR        | 0.1   | 0.2          | 0.0     | 0.3      |
| R53           | PRO -> GLU        | 0.0   | 7.4          | NaN     | 2.0      |
| R54           | PROCOA + CO2 -> 0.5*SUC + 0.5*SUC | 0.7 | 0.3 | 0.1 | 1.3 |
| R55           | VAL -> VAL1 + CO2 | 0.7   | 0.3          | 0.1     | 1.3      |
| R56           | VAL1 -> PROCOA + CO2 | 0.7 | 0.3 | 0.1 | 1.3 |
| R57           | ACAC -> ACCOA + ACAC | 0.3 | 0.6 | NaN | 1.2 |
| R58           | LEU -> LEU1 + CO2 | 0.3   | 0.4          | 0.0     | 1.1      |
| R59           | LEU1 + CO2 -> ACCOA + ACAC | 0.3 | 0.4 | 0.0 | 1.1 |
| R60           | THR -> GLY + ACAC | 0.5   | 0.3          | 0.0     | 1.0      |
| R61           | KETOADI -> ACAC + CO2 | 0.0 | 0.3 | 0.0 | 0.4 |
| R62           | LYS -> KETOADI + CO2 | 0.0 | 0.3 | 0.0 | 0.4 |
| R63           | TYR -> 0.5*SUC + 0.5*SUC + TYR1 | 0.0 | 0.2 | 0.0 | 0.4 |
| Lact Out net  | LAC <-> LAC.EX    | -4.8  | 0.3          | -5.2    | -4.3     |
| Lact Out exch | LAC <-> LAC.EX    | 0.0   | 20764.8      | 0.0     | 9.1      |
| Symmetric B1 net | AKG <-> SUC + CO2 | 53.0 | 14.7 | 48.6 | 60.7 |
| Symmetric B1 exch | AKG <-> SUC + CO2 | 14.7 | 10.4 | 1.5 | 29.2 |
| Symmetric B2 net | SUC <-> FUM      | 53.7  | 14.8         | 49.0    | 61.5     |
| Symmetric B2 exch | SUC <-> FUM      | 10097522.9 | 20764.8 | 0.0 | Inf     |
| PYR In net    | 0*PYR.EX <-> 0*PYR | 0.2   | 29365.9      | NaN     | NaN      |
| PYR In exch   | 0*PYR.EX <-> 0*PYR | 0.0   | 20764.8      | 0.0     | Inf      |
| GLX 2         | 0*GLU -> 0*GLX    | 39.4  | 20764.8      | NaN     | Inf      |
| ASX 1         | 0*ASN -> 0*ASX    | 0.5   | 20764.8      | 0.0     | Inf      |
| ASX 2         | 0*ASP -> 0*ASX    | 111.1 | 20764.8      | 0.0     | Inf      |
| Ser Dilution  | 0*SER -> SER.ms   | 0.0   | 29365.9      | NaN     | NaN      |
| Ser Dilution 2 | SER.ul -> SER.ms  | 7.8   | 20764.8      | NaN     | NaN      |
| Ser Dilution 3 | SER.ms -> sink    | 7.8   | 20764.8      | NaN     | Inf      |
| Pyr Dilution 1 | 0*PYR -> PYR.ms   | 2.6   | 29365.9      | NaN     | NaN      |
| Pyr Dilution 2 | PYR.ul -> PYR.ms  | 0.5   | 20764.8      | NaN     | NaN      |
| Pyr Dilution 3 | PYR.ms -> PYR.sink| 3.1   | 20764.8      | NaN     | Inf      |
| Mal Dilution 2 | MALul -> MAL.ms   | 0.1   | 20764.8      | NaN     | Inf      |
| Mal Dilution 3 | MAL.ms -> MAL.sink| 0.1   | 20764.8      | NaN     | Inf      |
| Reaction Name | Chemical Reaction   | Flux | Standard Err | 95% Low | 95% High |
|---------------|---------------------|------|--------------|---------|----------|
| CIT Dil 2     | ICl.ul -> ICl.ms    | 0.0  | 20764.8      | NaN     | Inf      |
| CIT Dil 3     | ICl.ms -> ICl.sink  | 0.0  | 20764.8      | NaN     | Inf      |

"Net" reactions indicate the net flux in the forward direction for reversible reactions. "Exchange" reactions represent the forward flux for the reaction as written. Dilution reactions help account for unlabeled sources of certain measured metabolites.
## Late Exponential Gln-Supp. Media MFA Results

| Reaction Name | Chemical Reaction | Flux  | Standard Err | 95% Low | 95% High |
|---------------|-------------------|-------|--------------|---------|----------|
| Glucose In    | G6P_EX -> G6P     | 30.3  | 0.0          | 30.3    | 30.3     |
| R2            | G6P -> F6P        | 21.1  | 8.7          | 19.4    | 23.8     |
| R3 net        | F6P <-> G3P + G3P | 25.7  | 2.9          | 25.1    | 28.2     |
| R3 exch       | F6P <-> G3P + G3P | 0.0   | 21159.6      | NaN     | 769832.7 |
| R4            | G3P -> PEP        | 53.0  | 3.0          | 51.5    | 56.0     |
| PEP to Pyr    | PEP -> PYR        | 63.7  | 21159.6      | 62.2    | 69.0     |
| Pyr to Lac net| PYR <-> LAC       | -6.6  | 0.3          | -7.2    | -6.0     |
| Pyr to Lac exch| PYR <-> LAC     | 2746.9| 8799978.2    | 127.3   | 1744566.5|
| R7            | G6P -> P5P + CO2  | 7.9   | 8.7          | 0.4     | 9.6      |
| R8 net        | P5P + P5P <-> S7P + G3P | 2.3 | 2.9 | -0.2 | 2.8 |
| R8 exch       | P5P + P5P <-> S7P + G3P | 0.0 | 73.3 | NaN | Inf |
| R9 net        | S7P + G3P <-> F6P + E4P | 2.3 | 2.9 | -0.2 | 2.8 |
| R9 exch       | S7P + G3P <-> F6P + E4P | 0.0 | 21159.6 | 0.0 | 69006.2 |
| R10 net       | P5P + E4P <-> F6P + G3P | 2.3 | 2.9 | -0.2 | 2.8 |
| R10 exch      | P5P + E4P <-> F6P + G3P | 0.0 | 10.5 | 0.0 | 4.7 |
| R11           | PYR -> ACCOA + CO2 | 64.2 | 3.2 | 61.7 | 67.9 |
| R12 net       | ACCOA + OAA <-> ICI | 58.3 | 4.0 | 53.5 | 63.8 |
| R12 exch      | ACCOA + OAA <-> ICI | 47.2 | 22.4 | 17.7 | 116.4 |
| R13 net       | ICI <-> AKG + CO2 | 58.3 | 4.0 | 53.5 | 63.8 |
| R13 exch      | ICI <-> AKG + CO2 | 51.9 | 19.5 | 23.5 | 114.3 |
| R17 net       | FUM <-> MAL       | 58.8 | 4.4 | 53.5 | 64.7 |
| R17 exch      | FUM <-> MAL       | 298.1 | 277.2 | 88.8 | 1811917.6 |
| R18 net       | MAL <-> OAA       | 59.3 | 29924.3 | 53.3 | 66.8 |
| R18 exch      | MAL <-> OAA       | 8451004.3 | 21159.6 | 385.7 | Inf |
| R19           | OAA -> PEP + CO2  | 10.7 | 21159.6 | 0.0 | 14.4 |
| R20 net       | MAL + PYR + CO2   | -0.6 | 29924.3 | -4.4 | 14.4 |
| R20 exch      | MAL + PYR + CO2   | 0.0 | 21159.6 | 0.0 | 14.4 |
| R21           | PYR + CO2 -> OAA  | 0.0 | 21159.6 | 0.0 | 4.4 |
| Ala Out net   | ALA <-> ALA.EX    | 3.0   | 0.3          | 2.4     | 3.6      |
| Ala Out exch  | ALA <-> ALA.EX    | 0.2   | 21841.2      | NaN     | 2.9      |
| Arg In        | ARG_EX -> ARG     | 2.0   | 0.2          | 1.9     | 2.2      |
| Asn In net    | ASN.EX <-> ASN    | 3.9   | 0.4          | 3.2     | 4.7      |
| Asn In exch   | ASN.EX <-> ASN    | 4.4   | 2261.3       | NaN     | 9.8      |
| Asp In net    | ASP.EX <-> ASP    | 8.5   | 0.4          | 7.7     | 9.4      |
| Asp In exch   | ASP.EX <-> ASP    | 91.4  | 16.2         | 67.8    | 130.3    |
| Cys In net    | CYS.EX <-> CYS    | 0.9   | 0.2          | 0.8     | 0.9      |
| Cys In exch   | CYS.EX <-> CYS    | 4.7   | 21159.6      | 0.0     | 141397.0 |
| Gln Out net   | GLN <-> GLN.EX    | -2.1  | 0.1          | -2.3    | -1.9     |
| Gln Out exch  | GLN <-> GLN.EX    | 0.0   | 0.0          | 0.0     | 0.0      |
| Glu In net    | GLU.EX <-> GLU    | 1.3   | 0.1          | 1.1     | 1.6      |
| Glu In exch   | GLU.EX <-> GLU    | 3.7   | 0.1          | 3.4     | 4.0      |
| Gly Out net   | GLY <-> GLY.EX    | -0.1  | 0.1          | -0.3    | 0.1      |
| Gly Out exch  | GLY <-> GLY.EX    | 9.7   | 87.9         | 0.8     | 35.2     |
| His in        | HIS.EX -> HIS     | 0.7   | 0.0          | 0.6     | 0.7      |
| Ile In        | ILE.EX -> ILE     | 1.5   | 0.1          | 1.4     | 1.6      |
| Leu In        | LEU.EX -> LEU     | 4.9   | 0.9          | 3.7     | 6.2      |
| Lys In        | LYS.EX -> LYS     | 2.8   | 0.3          | 2.6     | 3.1      |
| Met In        | MET.EX -> MET     | 1.2   | 0.0          | 1.1     | 1.3      |
| Phe In        | PHE.EX -> PHE     | 1.4   | 0.1          | 1.3     | 1.7      |
| Pro In        | PRO.EX -> PRO     | 4.1   | 1.5          | 3.9     | 4.6      |
| Ser In net    | SER.EX <-> SER    | 5.8   | 0.6          | 4.7     | 6.9      |
| Ser In exch   | SER.EX <-> SER    | 0.0   | 58.4         | 0.0     | 11.1     |
| Thr In        | THR.EX -> THR     | 2.5   | 0.3          | 2.1     | 3.0      |
| Reaction Name | Chemical Reaction | Flux  | Standard Err | 95% Low | 95% High |
|---------------|-------------------|-------|--------------|---------|----------|
| Tyr In        | TYR_EX -> TYR     | 1.7   | 0.2          | 1.4     | 2.0      |
| Val In        | VAL_EX -> VAL     | 2.8   | 0.3          | 2.3     | 3.3      |
| R43 net       | PYR <-> ALA       | 5.5   | 0.3          | 4.9     | 6.1      |
| R43 exh       | PYR <-> ALA       | 0.0   | 629344.5     | NaN     | 4453.0   |
| R44 net       | AKG <-> GLU       | 0.1   | 1.5          | -0.5    | 0.5      |
| R44 exh       | AKG <-> GLU       | 121.6 | 36.5         | 72.0    | 272.6    |
| R45 net       | GLU <-> GLN       | 0.0   | 0.2          | -0.7    | -0.2     |
| R45 exh       | GLU <-> GLN       | 3045443.3 | 21159.6     | NaN     | Inf      |
| R46           | ARG -> GLU + CO2  | 0.0   | 0.2          | 0.0     | 0.2      |
| R47 net       | OAA <-> ASP       | -9.7  | 0.6          | -10.8   | -8.5     |
| R47 exh       | OAA <-> ASP       | 34.4  | 4.5          | 27.2    | 42.9     |
| R48 net       | ASP <-> ASN       | -2.9  | 0.4          | -3.6    | -2.1     |
| R48 exh       | ASP <-> ASN       | 19.2  | 21159.6      | NaN     | Inf      |
| R49 net       | G3P <-> SER       | 0.1   | 0.7          | -1.1    | 1.4      |
| R49 exh       | G3P <-> SER       | 2.2   | 23.9         | 0.1     | 4.9      |
| R50 net       | SER <-> GLY + CO2 | 2.7   | 0.3          | 2.1     | 3.3      |
| R50 exh       | SER <-> GLY + CO2 | 13.2  | 135.6        | 2.3     | 43.6     |
| R51           | SER -> CYS        | 0.0   | 0.2          | 0.0     | 0.1      |
| R52           | PHE -> TYR        | 0.0   | 0.1          | 0.0     | 0.3      |
| R53           | PRO -> GLU        | 0.0   | 1.5          | NaN     | 0.4      |
| R54           | PROCOA + CO2 -> 0.5*SUC + 0.5*SUC | 0.4 | 0.3 | 0.0 | 0.9 |
| R55           | VAL -> VAL1 + CO2 | 0.4   | 0.3          | 0.0     | 0.9      |
| R56           | VAL1 -> PROCOA + CO2 | 0.4 | 0.3 | 0.0 | 0.9 |
| R57           | ACAC -> ACCOA + ACCOA | 1.6 | 0.9 | 0.4 | 2.8 |
| R58           | LEU -> LEU1 + CO2 | 1.4   | 0.8          | 0.2     | 2.6      |
| R59           | LEU1 + CO2 -> ACCOA + ACAC | 1.4 | 0.8 | 0.2 | 2.6 |
| R60           | THR -> GLY + ACCOA | 0.4   | 0.3          | 0.0     | 0.9      |
| R61           | KETOADI -> ACAC + CO2 | 0.0 | 0.3 | NaN | 0.3 |
| R62           | LYS -> KETOADI + CO2 | 0.0 | 0.3 | NaN | 0.3 |
| R63           | TYR -> 0.5*SUC + 0.5*SUC + TYR1 | 0.2 | 0.2 | 0.0 | 0.6 |
| R64           | TYR1 -> ACAC + CO2 | 0.2   | 0.2          | 0.0     | 0.6      |
| Lact Out net  | LAC <-> LAC.EX    | -6.6  | 0.3          | -7.2    | -6.0     |
| Lact Out exh  | LAC <-> LAC.EX    | 0.0   | 21159.6      | 0.0     | 2.7      |
| Symmetric B1 net | AKG <-> SUC + CO2 | 58.2  | 4.2          | 53.2    | 63.9     |
| Symmetric B1 exh | AKG <-> SUC + CO2 | 0.0   | 6.6          | 0.0     | 4.9      |
| Symmetric B2 net | SUC <-> FUM      | 58.8  | 4.4          | 53.5    | 64.7     |
| Symmetric B2 exh | SUC <-> FUM      | 0.0   | 21159.6      | NaN     | 441074.3 |
| PYR In net    | 0*PYR.EX <-> 0*PYR | -0.3  | 29924.3      | NaN     | NaN      |
| PYR In exh    | 0*PYR.EX <-> 0*PYR | 0.0   | 21159.6      | 0.0     | NaN      |
| GLX 2        | 0*GLU -> 0*GLX    | 4.3   | 21159.6      | NaN     | Inf      |
| ASX 1        | 0*ASN -> 0*ASX    | 4.8   | 21159.6      | NaN     | Inf      |
| ASX 2        | 0*ASP -> 0*ASX    | 3.1   | 21159.6      | 0.0     | NaN      |
| Ser Dilution 2 | 0*SER -> SER.ms   | 9.7   | 29924.3      | 0.0     | NaN      |
| Ser Dilution 3 | SER.ms -> sink    | 11.0  | 21159.6      | NaN     | Inf      |
| Pyr Dilution 1 | 0*PYR -> PYR.ms   | 1.5   | 29924.3      | NaN     | NaN      |
| Pyr Dilution 2 | PYR.ul -> PYR.ms  | 1.0   | 21159.6      | NaN     | NaN      |
| Pyr Dilution 3 | PYR.ms -> PYR.sink | 2.5  | 21159.6      | NaN     | Inf      |
| Mal Dilution 2 | MALul -> MAL.ms   | 0.3   | 21159.6      | NaN     | Inf      |
| Mal Dilution 3 | MAL.ms -> MAL.sink | 0.3  | 21159.6      | NaN     | Inf      |
| Reaction Name | Chemical Reaction    | Flux | Standard Err | 95% Low | 95% High |
|---------------|----------------------|------|--------------|---------|----------|
| CIT Dil 2     | ICl.ul -> ICl.ms     | 0.2  | 21159.6      | NaN     | Inf      |
| CIT Dil 3     | ICl.ms -> ICl.sink   | 0.2  | 21159.6      | NaN     | Inf      |

"Net" reactions indicate the net flux in the forward direction for reversible reactions. "Exchange" reactions represent the forward flux for the reaction as written. Dilution reactions help account for unlabeled sources of certain measured metabolites.