

## 1. Project Information

|                           |                       |
|---------------------------|-----------------------|
| Program                   | Microbial             |
| JGI Sequencing Project ID | 1063231               |
| Sequencing Project Name   | Nostoc sp. Hyl-09-2-6 |

## 2. Read Statistics

|                               | Raw Reads           | Filtered SubReads   | Error Corrected Reads |
|-------------------------------|---------------------|---------------------|-----------------------|
| Reads                         | 681,608             | 246,814             | 14,157                |
| Bases                         | 2,261,069,456       | 973,927,563         | 96,263,902            |
| Avg Read Length               | 3,317.3 +/- 3,545.4 | 3,946.0 +/- 2,814.6 | 6,799.7 +/- 5,076.4   |
| Reads >5 kbp                  | 138,584             | 56,139              | 7,714                 |
| Bases, reads >5 kbp           | 1,239,019,787       | 455,706,462         | 84,293,122            |
| Avg Read Length, reads >5 kbp | 8,940.6 +/- 3,783.8 | 8,117.5 +/- 2,906.0 | 10,927.3 +/- 2,918.8  |

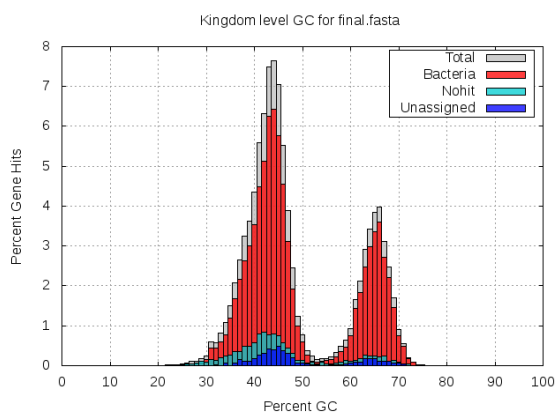
## 3. Assembly Statistics

|                                   |                      |
|-----------------------------------|----------------------|
| Scaffold total                    | 755                  |
| Contig total                      | 755                  |
| Scaffold sequence length          | 17.419 mb            |
| Contig sequence length            | 17.419 mb 0.000% gap |
| Scaffold N/L50                    | 8/258.431 kb         |
| Largest Contig                    | 3,241.0 kbp          |
| Number of scaffolds >50 kb        | 40                   |
| Pct of genome in scaffolds >50 kb | 74.85%               |

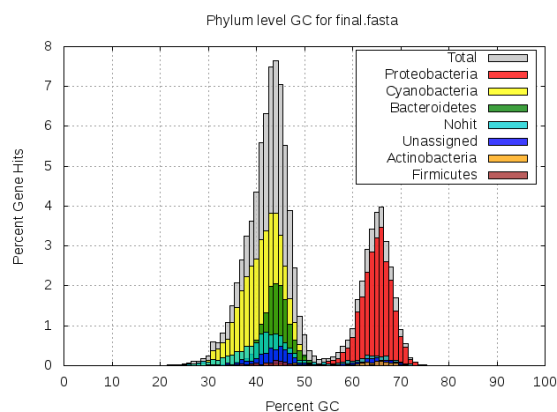
## 4. Assembly QC Results

GC histogram of the predicted genes on each contig, overlaid with GC of hits based on LAST, shown for different taxonomic levels.

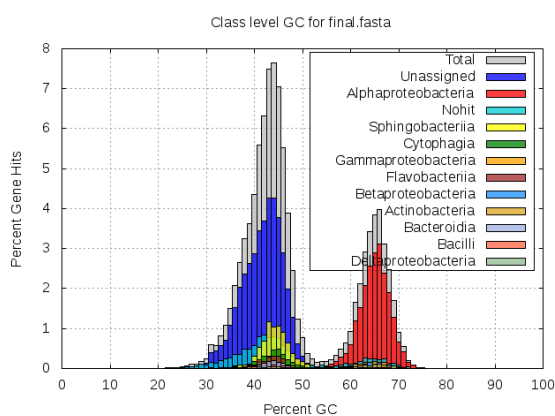
## Kingdom



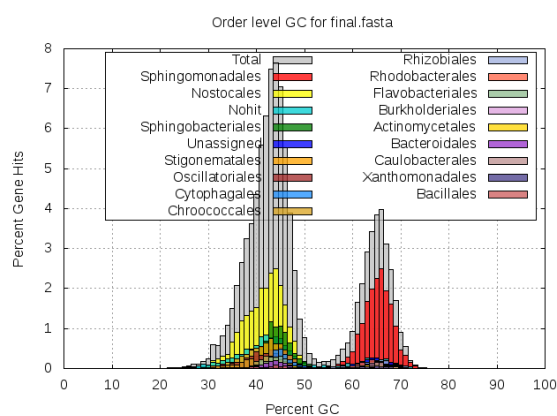
## Phylum



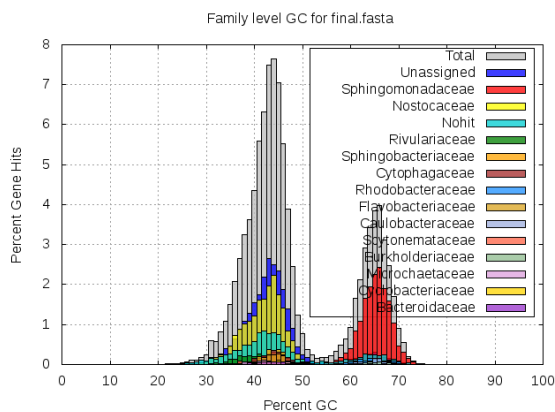
## Class



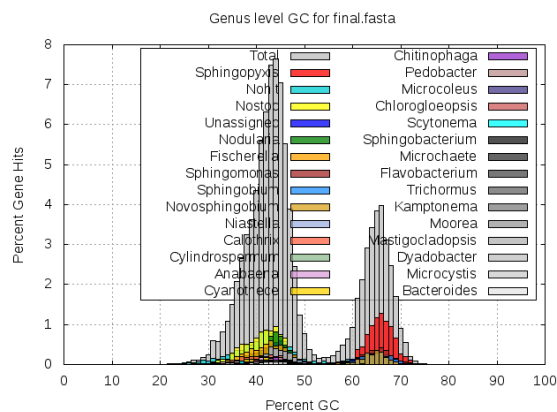
## Order

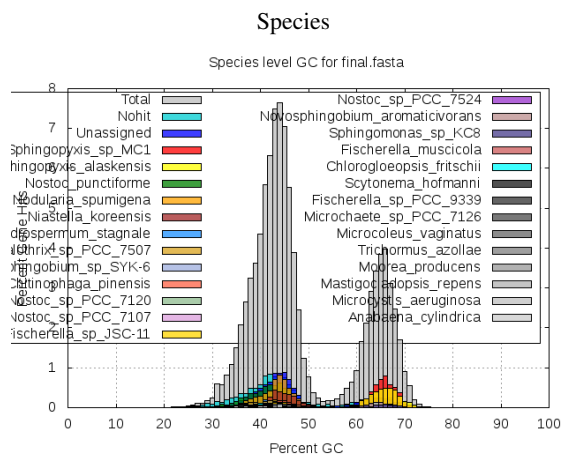


## Family

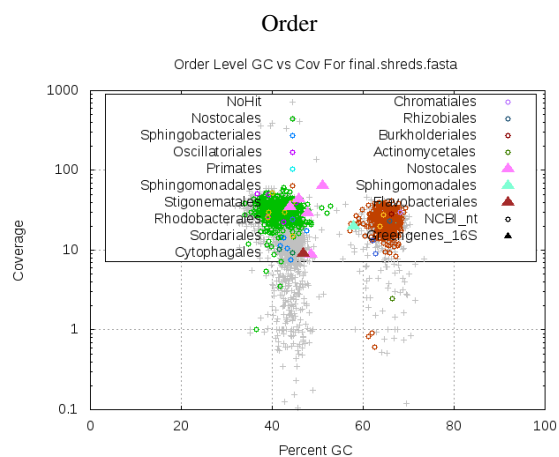
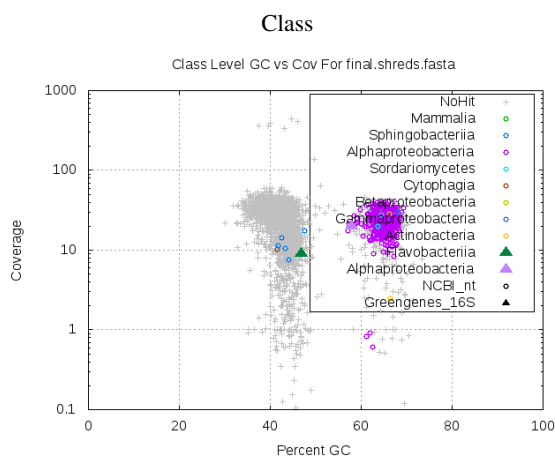
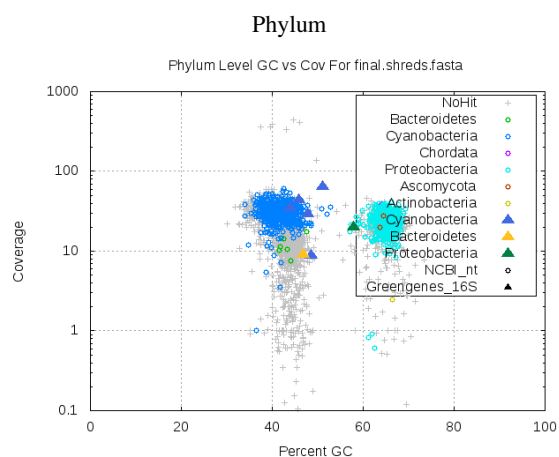
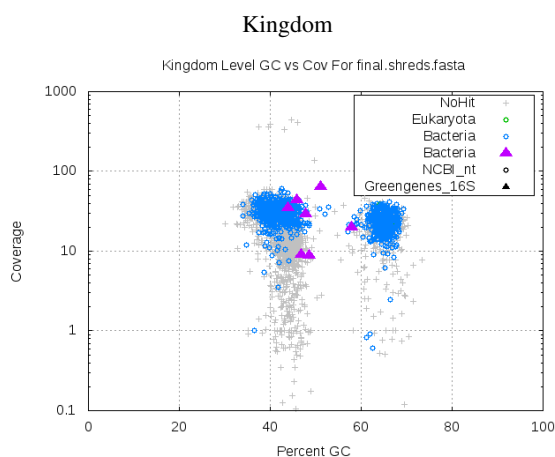


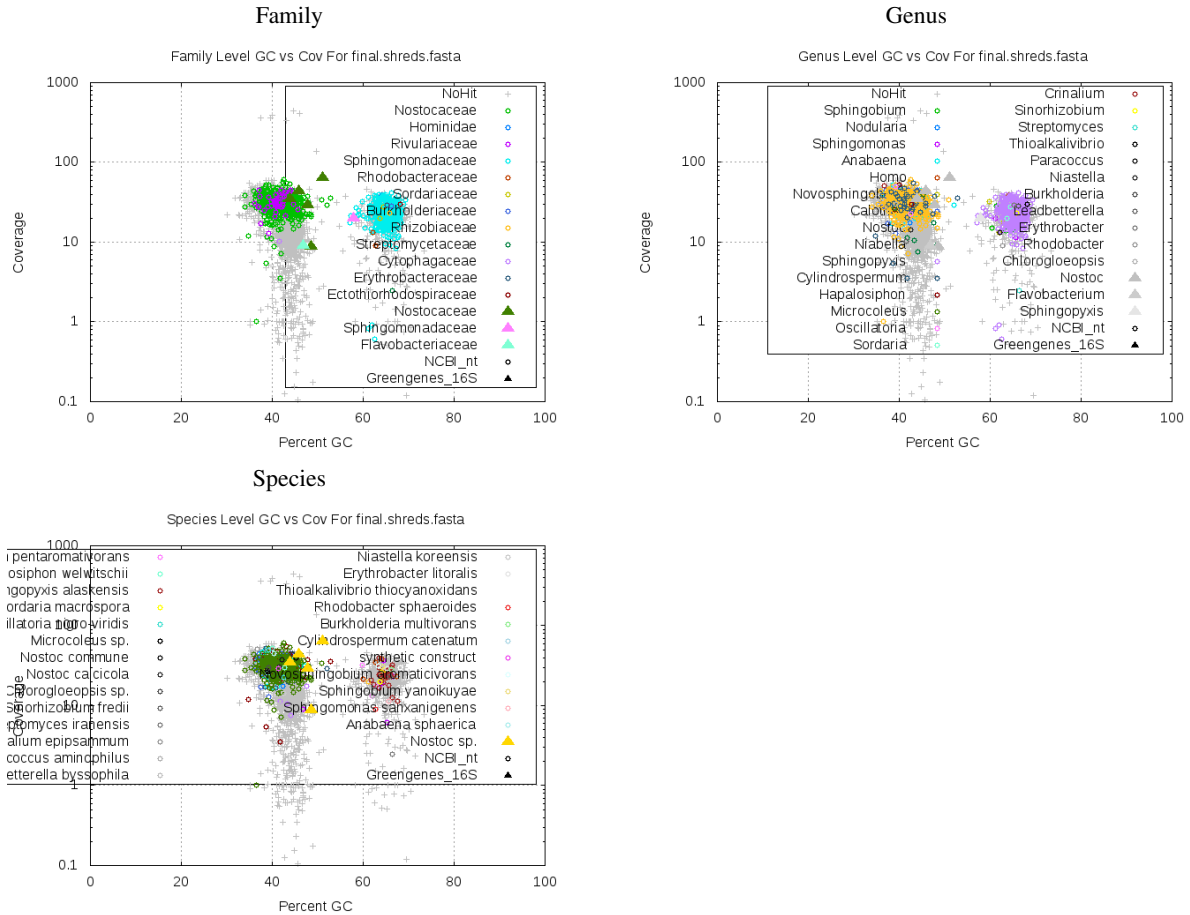
## Genus



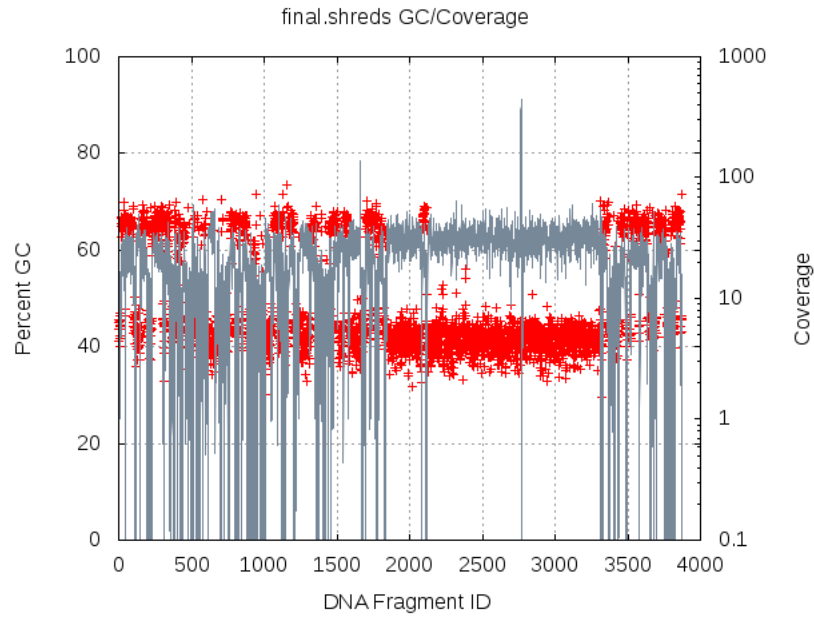


GC vs coverage based on GC of NCBI nt and Greengenes 16S rRNA gene hits to the assembly using megablast, shown for different taxonomic levels.

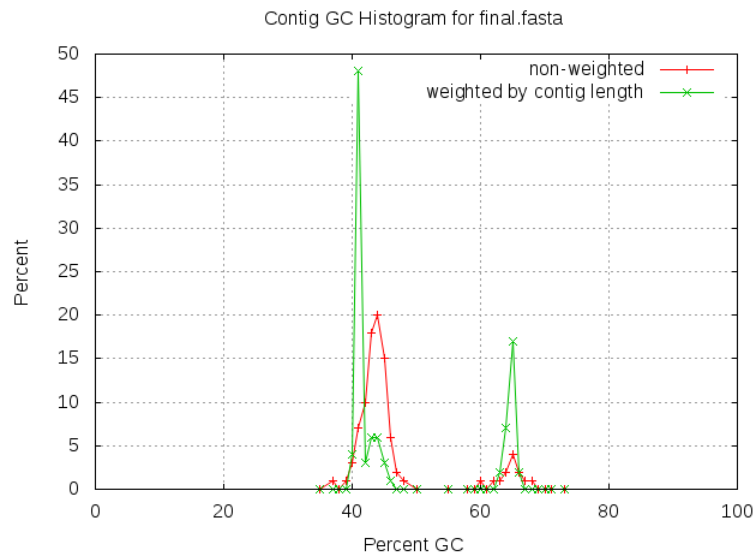




Coverage vs GC. Contigs were shredded into non-overlapping 5kbp and the GC of each shred was plotted as a point, colored by scaffold id. Coverage was calculated by mapping the fragment library to the final assembly and plotted as connected points.



GC histogram of the contigs, including contig length weighted distribution.



List of contigs and average percent GC bin:

| Pct GC Bin | Contig Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 35         | unitig_1 quiver, unitig_50 quiver, unitig_127 quiver, unitig_219 quiver, unitig_224 quiver, unitig_281 quiver, unitig_337 quiver, unitig_392 quiver, unitig_393 quiver, unitig_461 quiver, unitig_486 quiver, unitig_673 quiver, unitig_769 quiver, unitig_856 quiver, unitig_1200 quiver, unitig_1384 quiver, unitig_1401 quiver, unitig_1679 quiver, unitig_1692 quiver                                                                                                                                        |
| 40         | unitig_0 quiver, unitig_2 quiver, unitig_4 quiver, unitig_5 quiver, unitig_6 quiver, unitig_7 quiver, unitig_8 quiver, unitig_10 quiver, unitig_11 quiver, unitig_18 quiver, unitig_25 quiver, unitig_35 quiver, unitig_37 quiver, unitig_42 quiver, unitig_44 quiver, unitig_48 quiver, unitig_49 quiver, unitig_55 quiver, unitig_56 quiver, unitig_57 quiver, unitig_59 quiver, unitig_60 quiver, unitig_61 quiver, unitig_63 quiver, unitig_65 quiver, unitig_67 quiver, unitig_68 quiver, unitig_69 quiver, |

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|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | unitig_231 quiver, unitig_233 quiver, unitig_237 quiver, unitig_238 quiver, unitig_241 quiver, unitig_243 quiver, unitig_247 quiver, unitig_259 quiver, unitig_264 quiver, unitig_265 quiver, unitig_267 quiver, unitig_269 quiver, unitig_272 quiver, unitig_278 quiver, unitig_279 quiver, unitig_286 quiver, unitig_288 quiver, unitig_293 quiver, unitig_297 quiver, unitig_301 quiver, unitig_302 quiver, unitig_303 quiver, unitig_306 quiver, unitig_321 quiver, unitig_323 quiver, unitig_324 quiver, unitig_327 quiver, unitig_330 quiver, unitig_336 quiver, unitig_350 quiver, unitig_353 quiver, unitig_363 quiver, unitig_365 quiver, unitig_370 quiver, unitig_373 quiver, unitig_374 quiver, unitig_378 quiver, unitig_384 quiver, unitig_386 quiver, unitig_394 quiver, unitig_399 quiver, unitig_404 quiver, unitig_413 quiver, unitig_415 quiver, unitig_416 quiver, unitig_418 quiver, unitig_420 quiver, unitig_421 quiver, unitig_428 quiver, unitig_430 quiver, unitig_432 quiver, unitig_434 quiver, unitig_436 quiver, unitig_437 quiver, unitig_440 quiver, unitig_444 quiver, unitig_446 quiver, unitig_453 quiver, unitig_455 quiver, unitig_457 quiver, unitig_459 quiver, unitig_467 quiver, unitig_468 quiver, unitig_477 quiver, unitig_544 quiver, unitig_565 quiver, unitig_571 quiver, unitig_586 quiver, unitig_598 quiver, unitig_614 quiver, unitig_620 quiver, unitig_621 quiver, unitig_622 quiver, unitig_664 quiver, unitig_665 quiver, unitig_703 quiver, unitig_754 quiver, unitig_759 quiver, unitig_821 quiver, unitig_822 quiver, unitig_844 quiver, unitig_846 quiver, unitig_857 quiver, unitig_868 quiver, unitig_896 quiver, unitig_899 quiver, unitig_915 quiver, unitig_918 quiver, unitig_925 quiver, unitig_942 quiver, unitig_956 quiver, unitig_997 quiver, unitig_998 quiver, unitig_1015 quiver, unitig_1016 quiver, unitig_1017 quiver, unitig_1034 quiver, unitig_1043 quiver, unitig_1068 quiver, unitig_1069 quiver, unitig_1080 quiver, unitig_1081 quiver, unitig_1107 quiver, unitig_1113 quiver, unitig_1117 quiver, unitig_1135 quiver, unitig_1175 quiver, unitig_1177 quiver, unitig_1180 quiver, unitig_1182 quiver, unitig_1238 quiver, unitig_1240 quiver, unitig_1248 quiver, unitig_1255 quiver, unitig_1257 quiver, unitig_1266 quiver, unitig_1267 quiver, unitig_1288 quiver, unitig_1291 quiver, unitig_1296 quiver, unitig_1299 quiver, unitig_1332 quiver, unitig_1353 quiver, unitig_1393 quiver, unitig_1418 quiver, unitig_1451 quiver, unitig_1501 quiver, unitig_1513 quiver, unitig_1523 quiver, unitig_1525 quiver, unitig_1527 quiver, unitig_1539 quiver, unitig_1549 quiver, unitig_1567 quiver, unitig_1570 quiver, unitig_1594 quiver, unitig_1604 quiver, unitig_1637 quiver, unitig_1638 quiver, unitig_1651 quiver, unitig_1660 quiver, unitig_1694 quiver, unitig_1695 quiver, unitig_1703 quiver, unitig_1737 quiver, unitig_1741 quiver, unitig_1747 quiver |
| 50 | unitig_1070 quiver                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 55 | unitig_45 quiver, unitig_136 quiver, unitig_223 quiver, unitig_359 quiver, unitig_381 quiver, unitig_1065 quiver                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 60 | unitig_12 quiver, unitig_15 quiver, unitig_19 quiver, unitig_21 quiver, unitig_27 quiver, unitig_31 quiver, unitig_39 quiver, unitig_46 quiver, unitig_52 quiver, unitig_64 quiver, unitig_71 quiver, unitig_74 quiver, unitig_79 quiver, unitig_131 quiver, unitig_159 quiver, unitig_216 quiver, unitig_230 quiver, unitig_240 quiver, unitig_251 quiver, unitig_270 quiver, unitig_292 quiver, unitig_344 quiver, unitig_346 quiver, unitig_395 quiver, unitig_426 quiver, unitig_451 quiver, unitig_569 quiver, unitig_593 quiver, unitig_712 quiver, unitig_713 quiver, unitig_805 quiver, unitig_815 quiver, unitig_835 quiver, unitig_884 quiver, unitig_885 quiver, unitig_1007 quiver, unitig_1013 quiver, unitig_1079 quiver, unitig_1105 quiver, unitig_1123 quiver, unitig_1140 quiver, unitig_1183 quiver, unitig_1340 quiver, unitig_1419 quiver unitig_1668 quiver                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 65 | unitig_9 quiver, unitig_13 quiver, unitig_14 quiver, unitig_16 quiver, unitig_17 quiver, unitig_20 quiver, unitig_22 quiver, unitig_23 quiver, unitig_24 quiver, unitig_26 quiver, unitig_28 quiver, unitig_29 quiver, unitig_30 quiver, unitig_32 quiver, unitig_33 quiver, unitig_34 quiver, unitig_36 quiver, unitig_40 quiver, unitig_41 quiver, unitig_43 quiver, unitig_47 quiver, unitig_51 quiver, unitig_53 quiver, unitig_54 quiver, unitig_58 quiver, unitig_113 quiver, unitig_139 quiver, unitig_154 quiver, unitig_157 quiver, unitig_196 quiver, unitig_228 quiver, unitig_282 quiver, unitig_326 quiver, unitig_339 quiver, unitig_347 quiver, unitig_357 quiver, unitig_369 quiver, unitig_407 quiver, unitig_409 quiver, unitig_414 quiver, unitig_443 quiver, unitig_450 quiver, unitig_466 quiver, unitig_487 quiver, unitig_515 quiver, unitig_519 quiver, unitig_562 quiver, unitig_616 quiver, unitig_654 quiver, unitig_695 quiver, unitig_756 quiver, unitig_764 quiver, unitig_825 quiver, unitig_908 quiver, unitig_989 quiver, unitig_990 quiver, unitig_1046 quiver, unitig_1049 quiver, unitig_1088 quiver, unitig_1295 quiver, unitig_1410 quiver, unitig_1562 quiver                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 70 | unitig_362 quiver, unitig_472 quiver, unitig_489 quiver, unitig_1014 quiver, unitig_1122 quiver, unitig_1433 quiver                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

List of the top contig megablast hits against potential reagent and process contaminants.

| Organism                                              | Align Length (bp) | Pct Id | Contig Name      |
|-------------------------------------------------------|-------------------|--------|------------------|
| <i>Ralstonia pickettii</i> 12J chromosome 1, complete | 215               | 93.02  | unitig_71 quiver |

List of the top contig megablast hits against 16S ribosomal RNA genes.

| Organism                                                  | Align Length (bp) | Pct Id | Contig Name       |
|-----------------------------------------------------------|-------------------|--------|-------------------|
| 154287 <i>Flavobacterium ferrugineum</i> str. DSM 30193 A | 1,520             | 94.67  | unitig_142 quiver |
| M230484.1                                                 |                   |        |                   |
| 265141 <i>Nostoc</i> sp. str. Cr4 AM711533.1              | 1,462             | 99.11  | unitig_0 quiver   |
| 825426 <i>Sphingopyxis</i> sp. str. BZ2 HQ588828.1        | 1,481             | 99.73  | unitig_71 quiver  |

## 5. Data Access

The following sequence fasta files can be downloaded from our JGI portal website.  
<http://www.jgi.doe.gov/genome-projects>

The annotation of the assembled contigs can be found within IMG.  
<http://img.jgi.doe.gov>

## 6. Methods

### Isolate Improved Draft

#### Genome sequencing and assembly

The draft genome of *Nostoc sp.* was generated at the DOE Joint Genome Institute (JGI) using the Pacific Biosciences (PacBio) sequencing technology [1]. A >10kpb Pacbio SMRTbell™ library was constructed and sequenced on the PacBio RS platform, which generated 246,814 filtered subreads totaling 973.9 Mbp. All general aspects of library construction and sequencing performed at the JGI can be found at <http://www.jgi.doe.gov>. The raw reads were assembled using HGAP (version: 2.3.0, protocol version=2.3.0 method=RS\_HGAP\_Assembly.3, smrtpipe.py v1.87.139483,) [2]. The final draft assembly contained 755 contigs in 755 scaffolds, totaling 17.419 Mbp in size. The input read coverage was 47.0X.

#### Genome annotation

Genes were identified with Prodigal [3], followed by one round of manual curation using GenePRIMP [4] for genomes in fewer than 10 scaffolds. The predicted CDSs were translated and used to search the National Center for Biotechnology Information (NCBI) nonredundant database, UniProt, TIGRFam, Pfam, KEGG, COG, and InterPro databases. The tRNAscanSE tool [5] was used to find tRNA genes, whereas ribosomal RNA genes were found by searches against models of the ribosomal RNA genes built from SILVA [6]. Other non-coding RNAs such as the RNA components of the protein secretion complex and the RNase P were identified by searching the genome for the corresponding Rfam profiles using INFERNAL [7]. Additional gene prediction analysis and manual functional annotation was performed within the Integrated Microbial Genomes (IMG) platform [8] developed by the Joint Genome Institute, Walnut Creek, CA, USA [9].

1. Eid John, et al. Real-Time DNA Sequencing from Single Polymerase Molecules. Science 2008
2. Chin C, et al. Nonhybrid, finished microbial genome assemblies from long-read SMRT sequencing data. Nat Methods 2013
3. Hyatt D, Chen GL, Lacascio PF, Land ML, Larimer FW, Hauser LJ. Prodigal: prokaryotic gene recognition and translation initiation site identification. BMC Bioinformatics 2010; 11:119.
4. Pati A, Ivanova NN, Mikhailova N, Ovchinnikova G, Hooper SD, Lykidis A, Kyrpides NC. GenePRIMP: a gene prediction improvement pipeline for prokaryotic genomes. Nat Methods 2010; 7:455–457.
5. Lowe TM, Eddy SR. tRNAscan-SE: a program for improved detection of transfer RNA genes in genomic sequence. Nucleic Acids Res 1997; 25:955–964.
6. Pruesse E, Quast C, Knittel, Fuchs B, Ludwig W, Peplies J, Glckner FO. SILVA: a comprehensive online resource for quality checked and aligned ribosomal RNA sequence data compatible with ARB. Nuc Acids Res 2007; 35: 2188–7196.
7. INFERNAL. Inference of RNA alignments. <http://infernal.janelia.org>.
8. The Integrated Microbial Genomes (IMG) platform. <http://img.jgi.doe.gov>.
9. Markowitz VM, Mavromatis K, Ivanova NN, Chen IMA, Chu K, Kyrpides NC. IMG ER: a system for microbial genome annotation expert review and curation. Bioinformatics 2009; 25:2271–2278.