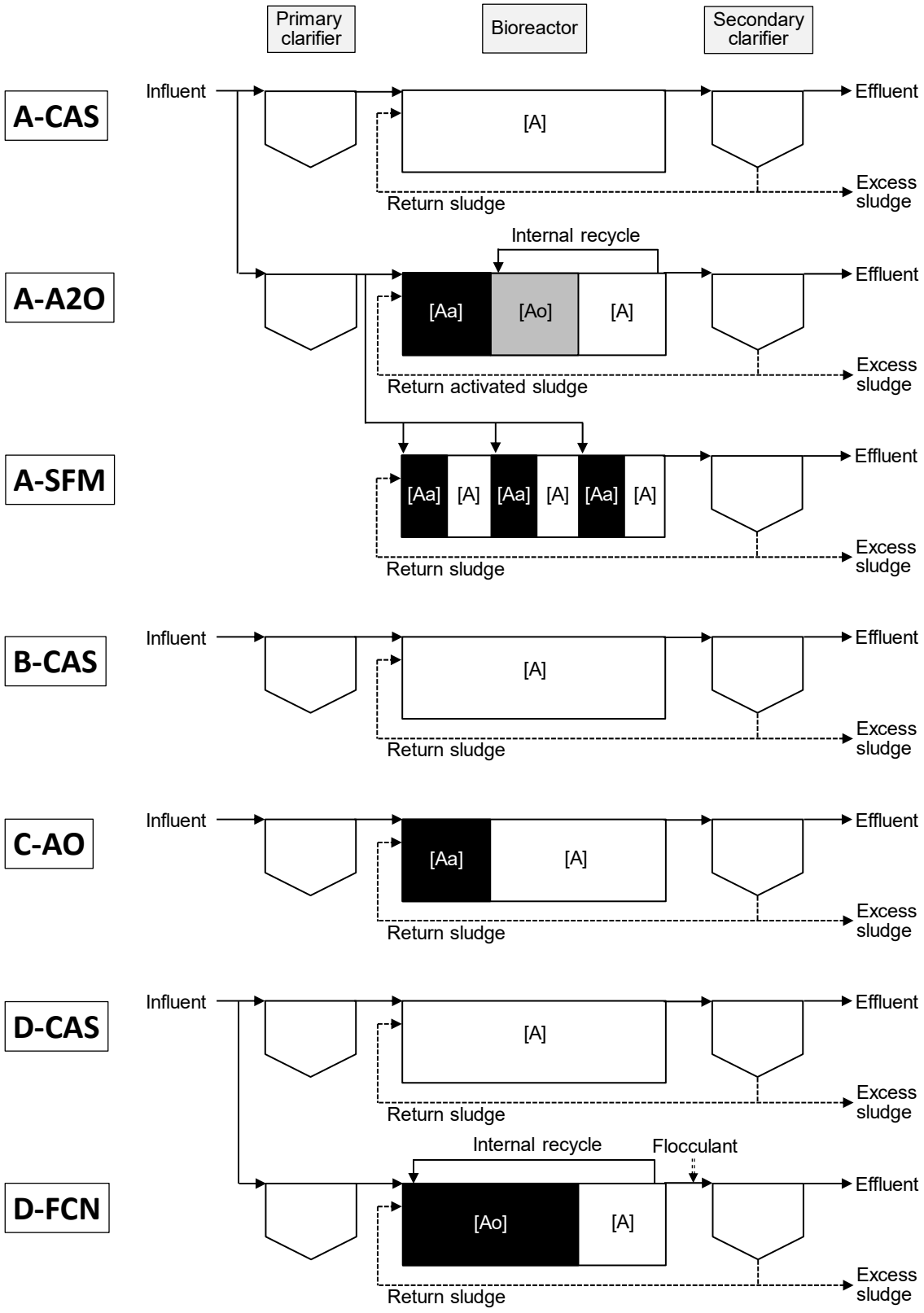
Supplementary Material



Appendix A Schematic representation of the processes studied in this study. [A], aerobic tank; [Aa], anaerobic tank; [Ao], anoxic tank

Appendix B List of detected probes and their signal to noise ratios in sludge samples A-CAS, A-A2O, A-SFM, B-CAS, C-AO, D-CAS, and D-FCN

target gene	target microorganism (accession No.)	signal to noise ratio						
		A-CAS	A-A2O	A-SFM	B-CAS	C-AO	D-CAS	D-FCN
nif	*Azospira restricta* (EF158046)	1.070						
	Azospirillum lipoferum (AF216882)	10.860		1.208	3.974	1.347	3.665	
	Azovibrio restrictus (U97119)	1.913						
	Beijerinckia indica subsp. *Indica* (AF302904)	2.447						
	Bradyrhizobium elkanii (AY599092)	1.165						
	Bradyrhizobium elkanii (EU418414)	1.352						
	Bradyrhizobium japonicum (AJ563961)	6.844	5.449	3.214	2.034			
	Bradyrhizobium japonicum (EU357921)	1.338			1.874			
	Burkholderia silvatlantica (EF158807)	1.413						
	Burkholderia vietnamiensis (EF158811)	1.100				1.257		
	Burkholderia sp. Br3469 (AY533868)	1.110						
	Burkholderia phymatum STM815 (AJ505319)				1.034			
	Burkholderia phymatum STM815 (AJ505319)						1.162	
	Corynebacterium sp. 12a (EU035276)	2.508			1.501		1.133	
	Desulfosporosinus orientis (AF227925)	2.237		1.569	2.039			
	Devosia neptuniae (AF487824)	2.184				1.003		
	Frankia sp. (X76399)	1.411					1.061	
	Frankia sp. 32-75 (FJ477445)	1.009						

Mesorhizobium sp. BA134 (EU748940)	2.215		1.279		
Methanobacterium ivanovii (X07501)	1.983				
Methanococcus voltae (X03777)	1.726				
Methanothermobacter thermautotrophicus (AY221829)	1.059				
Methylocystis methanolicus (AF484660)					1.087
Methylocystis minimus (AF484658)	1.693				
Natronobacillus azotifigens (EU850819)	2.655		2.650		
Paenibacillus durus (AJ224423)	1.316				
Paenibacillus macerans (AJ223993)	2.718				
Paenibacillus odorifer (AJ223992)	1.729				
Pantoea agglomerans (M26932)	2.404				
Rhizobium etli bv. Mimosae (AY907497)	15.149		3.785	1.019	9.200
Rhizobium leguminosarum (EU770980)	2.670				2.848

Appendix B (Continued)

target gene	target microorganism (accession No.)	signal to noise ratio						
		A-CAS	A-A2O	A-SFM	B-CAS	C-AO	D-CAS	D-FCN
nif	*Rhizobium lusitanum* (AY943644)						1.180	
	Scytonema hofmanni UTEX 2349 (DQ531684)	1.261						
	Shinella kummerowiae (EU200977)						2.271	
	Sinorhizobium medicae (AY929546)				3.623			
	Sinorhizobium meliloti (EU849575)	1.681					1.966	
	Sinorhizobium meliloti (FM178864)	1.294						
	Sinorhizobium saheli (Z95221)	1.307					2.783	
	Sinorhizobium sp. CCBAU 31015 (EU113223)	2.373						
	Sinorhizobium xinjiangense (DQ411933)	2.052						
	Spirirestis rafaelensis SRS70 (DQ531685)	1.227						
	Vibrio sp. MSSRF39 (EU620234)						5.207	
	Vibrio sp. 9b (EU035275)	1.449				7.500		
amo	*Nitrosomonas eutropha* C91 (AJ298713)	2.519						
	Nitrosomonas halophila (AF272398)	2.410						
	Nitrosomonas oligotropha (AF272406)	1.548						
	Nitrosomonas sp.	2.726						

	NL7 (AY958704)							
	Nitrosospira briensis (U76553)	1.595						
	Nitrosospira multiformis ATCC 25196 (X90822)	1.915				1.088		
	Nitrosospira sp. EnI299 (EF175100)	1.330						
	Nitrosospira sp. F3 (AJ298691)					1.013	8.117	1.438
	Nitrosospira sp. LT2Fb (AY189146)	1.140						
	Nitrosospira sp. LT2MFa (AY189145)	7.033		1.317	4.961	4.199	4.780	
	Nitrosovibrio tenuis (U76552)	4.702		1.538	3.271	1.248	2.301	
nap	*Campylobacter jejuni* subsp. *Doylei* (EF218738)	1.414						
	Emericella nidulans (EF592166)	4.782	1.261	1.404	6.734			
nar	*Geminicoccus roseus* (AM419355)				1.557			
	Hydrogenophaga sp. D3-13.1 (AM419358)	1.931		1.387	1.973		3.781	
	Microbacterium sp. D1-15 (AM419350)	1.315		1.694		1.010	2.499	
	Pseudomonas sp. D7-10 (AM419367)						1.095	
	Staphylococcus sp. Lgg15.7 (AJ314953)	1.960		3.700	2.105			

Appendix B (Continued)

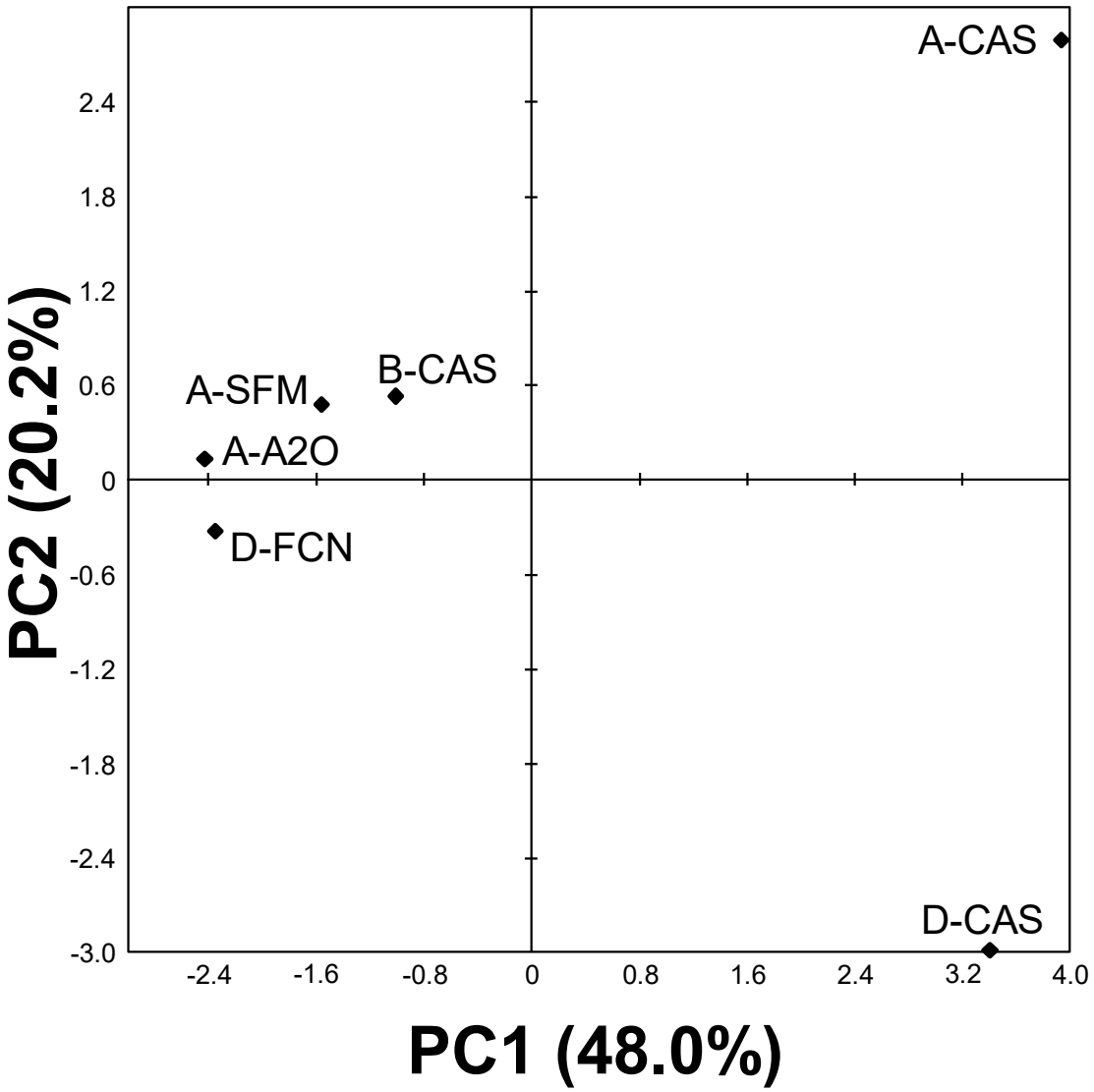
target gene	target microorganism (accession No.)	signal to noise ratio						
		A-CAS	A-A2O	A-SFM	B-CAS	C-AO	D-CAS	D-FCN
nirK	*Achromobacter xylosoxidans* (AJ224905)						2.909	
	Bacillus sp. (AM404294)	1.408						
	Hyphomicrobium zavarzinii (AJ224902)						1.451	
	Mesorhizobium sp. (AB196786)						1.185	
	Paracoccus denitrificans (AY345243)	1.886				1.042	4.259	
	Pseudomonas aeruginosa (AY345247)						1.061	
	Pseudomonas chlororaphis subsp. *Aureofaciens* (Z21945)	5.730		1.839	3.523		2.441	
	Sinorhizobium sp. R-32737 (AM403572)						1.659	
nirS	*Acidovorax* sp. R-25212 (AM230905)	1.035						
	Corynebacterium sp. 12a (EU035284)	1.799					1.065	
	Kocuria varians (AY345246)	1.200					2.414	
	Marinobacter sp. U31 (AJ626839)	1.629				1.644	1.337	
	Paracoccus denitrificans (U75413)	1.061						
	Paracoccus pantotrophus (AJ401462)	2.118				1.573	1.090	
	Paracoccus sp. R-24665 (AM230903)						1.123	

Paracoccus sp. R-27041 (AM230908)	2.609				5.003	
Paracoccus sp. R-28239 (AM230916)					3.582	
Paracoccus sp. R-28241 (AM230918)	4.336	1.355			7.314	
Pseudomonas grimontii (DQ518192)	1.501					
Pseudomonas sp. BA1.6 (AJ440493)	2.604			1.004	7.393	
Pseudomonas sp. BA2.5 (AJ440494)	2.082				3.830	
Pseudomonas sp. BH11.6 (AJ440496)					1.221	
Pseudomonas sp. PD 21 (DQ518196)	1.382					
Simplicispira limi (AM269908)					1.461	
Thauera linaloolentis (AY078265)					2.469	
Thauera mechernichensis (AY078268)	1.573				3.614	
Thauera sp. R-24450 (AM230892)	2.140			1.274	1.381	
Thauera sp. R-25071 (AM230899)	1.784		2.691		2.149	1.241
Thauera sp. R-28213 (AM230917)	1.629			1.590	1.227	

Appendix B (Continued)

target gene	target microorganism (accession No.)	signal to noise ratio						
		A-CAS	A-A2O	A-SFM	B-CAS	C-AO	D-CAS	D-FCN
cnor	*Azospirillum brasilense* (AB508912)	9.036	4.380	6.999	6.089	9.429	9.006	
	Azospirillum brasilense (AB508902)	2.030						
	Bacillus sp. R-32694 (AM403581)					2.030		
qnor	*Achromobacter denitrificans* (AM284322)	5.125			2.665		3.695	
	Alicycliphilus sp. R-24606 (AM284326)	2.341				1.198	2.069	
	Alicycliphilus sp. R-24611 (AM284328)					1.513		
	Cupriavidus necator (AM284317)	1.950					1.348	
	Diaphorobacter sp. R-24612 (AM284329)	1.676						
	Diaphorobacter sp. R-28417 (AM284321)	6.594			3.429	2.508	4.981	
	Pseudomonas sp. R-24261 (AM284318)	6.692			2.003	2.353	5.019	
	Pseudomonas sp. R-25208 (AM284331)					1.002		
	Pseudomonas sp. R-26828 (AM284319)	2.021				2.314		
nos	*Halomonas denitrificans* (FJ686166)	1.062				1.003	1.710	
	Marinobacter hydrocarbonoclasticus (FJ686171)					1.558		
	Paracoccus denitrificans (AY345244)	1.952					1.509	
	Paracoccus pantotrophus (AJ440508)						1.114	
	Paracoccus pantotrophus (AF016058)	10.503		1.021	3.099	1.230	3.336	

Paracoccus sp. BW001 (EU192075)	2.174			
Pseudomonas aeruginosa (AJ633101)			1.010	
Pseudomonas balearica (AJ633099)				1.489
Pseudomonas grimontii (DQ377781)	1.384	2.608		1.194
Pseudomonas qianpuensis (DQ088666)				2.767
Pseudomonas sp. D6-18 (AM422887)	1.080			1.595
Pseudomonas sp. ED3 (AJ704213)	2.744			3.951
Pseudomonas sp. PD 14 (DQ377786)	6.996	1.017		3.729



Appendix C Scatter diagram obtained by PCA with both nitrifying and denitrifying genes.